Expanding Audience Engagement with State Wildlife Agencies: Strategies for Supporting Diverse Participation

Kelsey K. Jennings

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Science

in

Fisheries and Wildlife Sciences

Ashley A. Dayer, Co-Chair
Willandia A. Chaves, Co-Chair
Maryam Kamran

April 04, 2024
Blacksburg, Virginia

Keywords: human dimensions, volunteerism, donation behavior, DEI, wildlife viewing, conservation behavior, conservation social science

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Abstract (Academic)

State fish and wildlife agencies are increasingly expected to meet accelerating wildlife conservation needs while addressing systemic problems that limit who has historically been able to access wildlife and conservation. To effectively address both of these needs, agencies need to better understand their constituencies, including both long-standing supporters and those who have been historically excluded. This thesis set out to achieve this through three chapters. (i) Using a nationwide panel survey, we sought to understand how patterns of wildlife viewing differ between Black, Indigenous, and people of color (BIPOC) and White viewers, as well as what most strongly supports this participation. We found that participation rates differ across ethnoracial groups, with most BIPOC viewers participating less than White viewers, especially around their homes. Additionally, BIPOC viewers indicated that social support was a key factor in encouraging participation. Finally, despite wildlife viewing being of similar or greater importance to BIPOC participants, they generally self-identified less as viewers, suggesting historic exclusion from wildlife viewing locales may impact contemporary participation. (ii) Through a questionnaire of Minnesotans engaged with the MN Department of Natural Resources and their Nongame Wildlife Program, we examined what most encourages donations and volunteer participation. The findings of this chapter suggest that donors had specific motivations, namely supporting biodiversity and conservation, whereas volunteer motivations were more varied, such as place-based preferences and access to conservation professionals. (iii) Using a series of focus groups with outdoor recreation and community science practitioners and participants, we aimed to understand what encouraged BIPOC Minnesotans to participate in nature-based community science programs. We found that participants rely on numerous forms of cultural capital to persist in community science, especially in inhospitable environments. Often, this included utilizing social relationships and continuing to participate despite negative interactions. Overall, this research contributes to a growing body of literature aiming to understand diverse engagement in wildlife viewing and nature-based community science, as well as general engagement with state agencies. By laying a foundation for sustainable engagement and support of diverse communities, particularly BIPOC groups, this thesis provides insights and recommendations for fostering equitable conservation practices in an era of environmental change and social evolution.

Expanding Audience Engagement with State Wildlife Agencies: Strategies for Supporting Diverse Participation

Kelsey Jennings

General Audience Abstract

North America and the world are witnessing unprecedented environmental changes, including biodiversity loss, climate change, and urbanization, impacting both human and wildlife communities. Concurrently, shifts in public engagement with state wildlife agencies and outdoor recreation are evident, with historic constituencies of hunters and anglers declining, posing challenges to conservation efforts. To address these challenges, state agencies strive to understand and diversify their supporters. Against this backdrop, this thesis investigates wildlife viewing patterns among ethnoracial groups, constituent engagement with state wildlife agencies, and factors motivating participation in community science initiatives among Black, Indigenous, and people of color (BIPOC) communities. Using a nationwide survey of wildlife viewers, we found significant differences in participation, both around and away from home. We also found that social support from friends, family, mentors, and peers was associated with increased participation. Additionally, despite wildlife viewing being of similar or greater importance to BIPOC participants, they generally self-identified less as viewers, suggesting historic exclusion from wildlife viewing locales may impact contemporary participation. Through a questionnaire of Minnesotans engaged with the MN Department of Natural Resources and their Nongame Wildlife Program, we examined what most encourages donations and volunteer participation. The findings of this chapter suggested that donors had specific motivations, namely supporting biodiversity and conservation, whereas volunteer motivations were more varied, such as place-based preferences and access to conservation professionals. Finally, using a series of focus groups with outdoor recreation and community science practitioners and participants, we aimed to understand what encouraged BIPOC Minnesotans to participate in nature-based community science programs. Our results suggested that social support, community-specific and community-led programs, and programs co-produced with community groups may facilitate participation in community science. Overall, this thesis provides vital recommendations for state agencies aiming to increase BIPOC participation in programs and better engage their constituencies. Through guidance on developing sustainable engagement strategies and how to best support diverse communities, particularly BIPOC groups, this thesis provides insights and recommendations for fostering equitable conservation in an era of environmental change and social evolution.

Acknowledgments

Succeeding at Virginia Tech would not have been possible without a huge network of support in my life, a full list of which would rival this thesis in length. Without you all, I would not have believed it was possible for me to thrive in this program. I have grown in innumerable ways, personally and professionally, and it would not have been possible without the following people.

First of all, my co-advisors, Drs. Willa Chaves and Ashley Dayer. For always knowing how to push me to find the answer but never pushing me too far. For encouraging me to take my own approach but reeling in my capriciousness. For building my self-sufficiency but never leaving me without backup. Without your kindness and guidance, I could have never achieved as much as I did. To my additional committee member and mentor, Dr. Maryam Kamran. For frank discussions and opportunities to chase my passions. For reminding me to stretch now that I'm no longer in my 20s. The three of you bettered my research in form, function, and reach. I will forever be grateful for your expertise, your candor, and your support. Thank you for always approaching conversations with a sense of levity and for laughing at my inane jokes, which only increased in obscurity with my stress levels.

Second, our partners in this research project, the Minnesota Department of Natural Resources' Nongame Wildlife Program (NWP) and the Association of Fish and Wildlife Agencies (AFWA). We endeavored to co-create as much of this research as possible, and without the patience and investment from the NWP, this would not have worked. To the entire team, I am grateful for the countless reviews, discussions, revisions, and reworkings to ensure this research would make a material difference for Minnesotans. As an extension, I thank our research participants. To our focus group members, it was truly a joy to talk with each and every one of you. I appreciated every story, from building community gardens to your love of fish to a genuine appreciation for every piece of the natural world. To our survey takers, I appreciate your investment and energy, and for those who reached out to ask questions, offer additional context, and affirm how important the work is.

Third, my fellow Dayer and Chaves Lab members. I am so fortunate to have not one but two incredible labs who always made time to support me and never hesitated to build me up. You kept me sane and buoyed me with friendship, laughs, and safe spaces to vent when things weren't going their best. Thank you for "giving me the big bed" in a surely haunted house, for finally liberating Tyrone and his contained colony, for feeding my partner an ungodly amount of pão de queijo, and for being willing to go down with the ship/the floor of our office. Thank you from the bottom of my heart. They say grad school is as much about who you meet as it is about what you learn, and I have met the best, most interesting, most wonderful people.

Last but not least, to my family. To aunts, uncles, grandparents, cousins, both mine and Rhys's, who put in immense effort to understand what exactly it is I do. To my brother, who was always interested in what I had going on or at least very good at faking it. To my parents for believing I could get this far and encouraging me to go for it but never pressuring me. For weekly phone calls and coming to us through rain, snow, and Indiana drivers. For living in a way that got me here. I would not be the person I am today without your love, encouragement, and support. To chosen family, HH, Taylor, for being with me every step of this journey. Taylor, for so much laughter I'll never need medicine, for doing everything first so I could see it wasn't as

scary as I thought, and for warming that bench with me more than 20 years ago. To Grandpa David, who told me that I would change the world so many times, I almost believe it. For Lefty Depp, for Lake City, and for not letting blood dictate family. Thank you all for the instrumental role you have played not only for the last three years but the last 30.

Finally, to Rhys. Words cannot describe my gratitude and appreciation for you. You moved to Virginia for me without a second thought! And while you'll never let me live it down, to say you did it willingly is an understatement. You have kept me fed, cared for a menagerie, and encouraged me in a million ways, from listening to all (seriously, every one of) my presentations and writings to always being up for a midday walk to the coffee shop. You make me feel like everything you do is for me. You are the greatest love of my life. Thank you.

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Introduction

North America is undergoing unparalleled change. Factors like widespread biodiversity loss, worsening climate change, and increased urbanization and industrialization of human populations are rapidly transforming human and wildlife communities (Association of Fish and Wildlife Agencies (AFWA), 2016; Bodo, 2019; Diffenbaugh et al., 2018; Lawrence et al., 2020; Reich et al., 2012). At the same time, our relationships with wildlife and the agencies that manage them are also changing. Historically, public engagement with state fish and wildlife agencies was limited to a heavily involved constituency of hunters and anglers (Geist et al., 2001), who were primarily White, middle- or upper-class men (Davis et al., 2002; Jacobson et al., 2022). Over the last few decades, however, we have seen steady declines in participation in hunting and angling as well as general decreases in revenue from the sales of these licenses (Berl et al., 2022). Over the same period, we have seen an increase in people with little or no connection to nature (Kellert et al., 2017; Larson et al., 2018). This combination creates a challenge for state wildlife agencies dealing with increased pressure on their wildlife populations but a decrease in funding and public engagement to enact successful conservation initiatives. To remain relevant and continue their missions, many state wildlife agencies are working to better understand their constituencies and diversify their supporters (Association of Fish and Wildlife Agencies (AFWA), 2016; Association of Fish and Wildlife Agencies (AFWA) & The Wildlife Management Institute (WMI), 2019; Berl et al., 2022).

Despite decreases in hunting and angling, other forms of outdoor recreation, including wildlife viewing (feeding, observing, or photographing wildlife), have steadily increased (AFWA & WMI, 2019). As of 2023, more than half of the U.S. adult population participates in some form of wildlife viewing (U.S. Department of the Interior et al., 2022). In 2016, about 80% participated on lands managed for public use, often those managed by state wildlife agencies (U.S. Department of the Interior et al., 2016). While wildlife viewing does not require participants to purchase a traditional permit like hunting and angling, viewers may provide similar financial support to their agencies compared to hunters, often through mechanisms like fees to access managed lands (Grooms et al., 2020). These fees allow viewers to participate in viewing on public lands and are a potential funding mechanism for agencies that are experiencing substantial decreases in their hunting and angling revenues. Generally, wildlife viewers are willing to make purchases for the sole benefit of supporting wildlife conservation. For example, many viewers purchase the Federal Duck Stamp, which is required for waterfowl hunters but also supports waterfowl conservation (Grooms et al., 2020; Shipley et al., 2018). Additionally, the American public supports new funding models such as increased sales tax, fees for resource extraction, and a more even split between public tax funds and hunting and fishing license fees to further support wildlife conservation (Larson et al., 2021).

Over the last few decades, many state wildlife agencies have also begun using volunteer science projects (called community science) to support on-the-ground conservation efforts (McKinley et al., 2017). Community science is widely defined as research conducted by the general public in collaboration with or under the guidance of institutions and professional scientists (Eitzel et al., 2017). Typically, state wildlife agencies use community science as a way to develop large datasets that can inform management decisions (Amano et al., 2016; Conrad &

Hilchey, 2011; McKinley et al., 2017; Shirk et al., 2012) and build stronger relationships between agencies and the greater constituency (Crain et al., 2014; Newman et al., 2017). However, like outdoor recreation, community scientists are often homogenous. White participants account for 89-95% of all community scientists, with over 80% holding bachelor's degrees and up to 40 % advanced degrees (vs 35% and 13%, respectively, among the US public), and with a median annual income ranging from $75,000 to $84,999 (vs a US median of $44,000) (Blake et al., 2020; Evans et al., 2005; Rutter et al., 2021; Trumbull et al., 2000; U.S. Census Bureau, 2021)

As we see shifts away from the public's historic methods of engagement with state agencies (e.g., hunting), we also see an increase in participation from groups that are historically underserved by state wildlife agencies, specifically communities of color (Rushing et al., 2019; U.S. DOI et al., 2001, 2016, 2022) This increase has been partly driven by the intentional engagement of these communities by state agencies and non-governmental organizations (NGOs) (Burns et al., 2008; Roberts, 2021; Rushing et al., 2019). However, it is often driven more by the intentional engagement and consistent support of community leaders who encourage participation in nature-based recreation in their communities (Bowden, 2021; Byrne, 2012; Roberts, 2021; Rushing et al., 2019). In part due to civil unrest and cultural conversations during the summer of 2020, many conservation organizations and state and federal agencies are reinvesting in programs to engage with communities that have previously been underserved or under-engaged (R. Jones, 2020; Rowland-Shea et al., 2020). This engagement is crucial in achieving ethnoracial equity in outdoor and nature-based recreation (Bowden, 2021; R. Jones, 2020; Roberts, 2021; Rowland-Shea et al., 2020).

With growing urbanization (Bodo, 2019) and diversifying ethnoracial demographics (N. Jones et al., 2021), it is of vital importance that we understand how constituencies are changing with regard to nature, wildlife, and nature-based recreation, especially those that have been historically underrepresented or excluded. My thesis aims to understand how wildlife viewing patterns differ among ethnoracial groups (Chapter 1), how constituents of a state fish and wildlife agency are motivated to support them (Chapter 2), and what most encourages Black, Indigenous, and people of color to participate in nature-based community science initiatives (Chapter 3).

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Chapter 1: Social Support and Identity Promote Diverse Participation in Wildlife Viewing

Abstract

Wildlife viewing is growing in popularity, especially among Black, Indigenous, and people of color (BIPOC), who participate in it over other forms of wildlife recreation. We used a nationwide sample of wildlife viewers to examine how identity as a wildlife viewer, the importance of wildlife viewing to one's life, ethnoracial identity, and social support influenced the degree of participation in wildlife viewing. We examined data as part of a non-probabilistic online survey of wildlife viewers (n= 17,104). We expected ethnoracial groups to significantly differ in their representation, participation, support, importance of wildlife viewing, and identity as wildlife viewers. We were particularly interested in how support varied across ethnoracial groups, as support has been found to affect involvement in other types of outdoor recreation. We also examined how identity as a wildlife viewer and the importance of wildlife viewing varied, as this has been shown to drive continued participation. We found that, compared to White groups, several other ethnoracial groups identified less as wildlife viewers but indicated that wildlife viewing is more important to them. We also found that most ethnoracial groups received more support from friends, mentors, etc., than White groups and participated similarly in wildlife viewing away from their homes. This research can help understand the participation of Black, Indigenous, and people of color in outdoor recreation. Further, this work demonstrates how legacies of racially motivated discriminatory policies may limit participation among ethnoracially-diverse communities.

Keywords: Outdoor Recreation; Wildlife Recreation; Diversity, Equity, and Inclusion; Birding

Introduction

Participation in nature-based activities provides a substantial benefit to human health (Bratman et al., 2012; Capaldi et al., 2015; Coventry et al., 2021; Jelks et al., 2021; Mantler & Logan, 2015; Martin et al., 2020). Yet, access to these activities is not equal among all people (Rigolon et al., 2018). As the wealth gap widens in the Global North (for example, North America, Europe, Japan, and Australia), segregation based on socioeconomic status and ethnoracial identity is intensifying (K. Jones et al., 2018; Tammaru et al., 2020; van Ham et al., 2020). High-income, primarily White neighborhoods often have the best access to high-quality green spaces. In contrast, lower-income neighborhoods, mainly composed of Black, Indigenous, and people of color (BIPOC), tend to have little to no access (Derkzen et al., 2017; Scarpa, 2016). Historic and prevailing systems of inequality, like redlining and gentrification, have and continue to separate BIPOC people from green spaces (Kronenberg et al., 2020; Nardone et al., 2021). Even when BIPOC communities have access to green spaces, they face more pronounced barriers to all forms of outdoor recreation, including less money, time, and access to green spaces; lack of knowledge about recreation locations; and apprehension surrounding comfort and safety (Floyd et al., 2016; Kellert et al., 2017; Outdoor Foundation, 2019). Additionally, preferred forms of recreation among BIPOC groups, like gathering in large social

groups, often lack investment or require additional, advanced permitting from park departments (Floyd et al., 2016).

Despite these barriers, a growing number of people in BIPOC communities in the United States and Europe are turning to nature-based activities (any activity occurring in green and blue spaces) as a way to engage with the outdoors (Edwards et al., 2022; Pharr & Lanham, 2023). For the purpose of this work, wildlife refers to "all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural environments, including in urban and semi-urban places" (Sinkular et al., 2022, p. 26). Wildlife viewing, as federally defined in the US, refers to "closely observing or trying to identify birds or other wildlife; photographing wildlife; feeding birds or other wildlife; maintaining natural areas… or plantings (shrubs, agricultural crops, etc.) where benefit to wildlife is the primary concern; or visiting parks and natural areas… for the primary purpose of observing, feeding, or photographing wildlife" (USDOI, 2016, p. 3). We recognize that these definitions may reflect Eurocentric views of nature and wildlife viewing and limit our sample to those who participate in wildlife viewing in this specific way. Even so, this form of wildlife viewing is among the most popular forms of nature-based activities (Connell, 2009; Rice et al., 2020; US DOI et al., 2016), with BIPOC participation nearly tripling in the last 20 years and outpacing the growth of White participation (US Department of the Interior et al., 2001, 2016). This study was part of a larger project that aimed to provide state wildlife agencies with relevant information on engaging wildlife viewers. Research that explores this type of participation and examines the factors that encourage BIPOC participants to engage in wildlife viewing is limited. To best support growing BIPOC communities' wildlife viewing, we must understand how to reduce barriers and encourage participation.

Racial disparities in access to high-quality green space and wildlife viewing

While segregation has been increasing globally, the US has a well-documented history of structural segregation (Catney, 2018), whereby significant disparities still exist between BIPOC and White communities (Duncan et al., 2013; Kephart, 2022; Nardone et al., 2021). Historical segregation tactics like redlining disenfranchised poor and/or BIPOC communities, making it harder for them to access housing and refinancing (Xu, 2022). These policies artificially reduced property values, resulting in higher levels of pollution, fewer city services and economic opportunities, and reduced access to high-quality green space, much of which persists today (Krimmel, 2018). Redlined neighborhoods are often still primarily populated by BIPOC communities (Nardone et al., 2021), who may have less opportunity to view wildlife close to their homes, given the often limited and low-quality green spaces in their neighborhoods (Kephart, 2022).

Despite these disparities, wildlife viewers who identify as Black, Indigenous, and people of color have nearly tripled in number since 2001 (US DOI et al., 2001, 2016). Still, wildlife viewers are overwhelmingly White and non-Hispanic (hereby, White), even with dramatic changes in the US population overall. In the last 20 years, the US BIPOC population increased from 25% in 2000 to 41% in 2020 (US Census Bureau, 2021), and more than 52% of people under 18 identify as BIPOC (Jones et al., 2021). However, recent studies show that only 10-14% of wildlife viewers identify as BIPOC (Patton, 2021; US DOI et al., 2016). Nevertheless,

younger and newer recruits to outdoor recreation are much more diverse than current participants, and these groups are rapidly increasing (Outdoor Foundation, 2023).

Social Support, Importance, and Identity

Our research aims to propose novel applications of social support, importance, and identity as primary factors associated with participation in wildlife viewing. Past research indicates that social support, or the perceived encouragement provided by friends, family, mentors, and peers (Gottlieb & Bergen, 2012), plays a prominent role in engagement in outdoor recreation (Schoffman et al., 2015). More specifically, increased social support has been shown to encourage sustained higher levels of participation in outdoor recreation (Gottlieb & Bergen, 2012; Schoffman et al., 2015). Despite an overall consensus on the importance of social connections in supporting involvement in wildlife viewing, few studies of BIPOC participants in outdoor recreation explore support and relationships as central motivators to participation. Social capital has been proposed as a mechanism among communities of color that helps navigate societal systems that are not designed with the BIPOC experience in mind (Yosso, 2005). In line with this, BIPOC birders with a friend or relative who engages in birding spend considerably more time and have more birding knowledge than those who do not (Rutter et al., 2021). Additionally, BIPOC people who participate in outdoor recreation utilize social support to persist in this behavior (Bagheri Hamaneh, 2024). However, social support remains an understudied aspect of BIPOC participation in outdoor recreation.

Whether or not people self-identify as wildlife viewers (identity) may also play a role in participation in wildlife viewing. Identity theory has emerged as a significant driver of behavior, arguing that adhering to one's self-identity is more predictive of behavior than other motivational frameworks (for example, the Theory of Planned Behavior [Ajzen, 1991]) (Rise et al., 2010). As identity is self-constructed, rather than driven externally by pressures to conform to prevailing attitudes or fear of being rejected by a dominant social group, it may be a more enduring and predictive motivator for participation (Rise et al., 2010). Within wildlife viewing, we are beginning to see identity explored. For example, wildlife viewers, both White and BIPOC, who strongly identify as birders show more commitment to birding than those who do not identify as strongly (Rutter et al., 2021; Scott & Shafer, 2001). Other research in environmentalism and conservation shows that BIPOC respondents have lower levels of identification as environmentalists when compared to White respondents despite being more concerned about environmental issues (Pearson et al., 2018).

Finally, wildlife viewers may be encouraged by how important wildlife viewing is to their lives. Harshaw et al.'s (2021) framework for specialization in outdoor recreation considers the behavioral (equipment and experience), cognitive (knowledge and skill), and affective (continued involvement and centrality) components of specialization in birding and angling, respectively. They found that each dimension contributes to specialization and continued behavior. For this research, we will only examine the affective dimension of specialization, hereby referred to as "importance." While all dimensions are valuable to understanding specialization (e.g., Harshaw et al., 2021; Rutter et al., 2021), we were more interested in understanding persistence in wildlife viewing. Importance has been highlighted as a valuable dimension in understanding persistence in outdoor recreation (e.g., Beardmore et al., 2013; Lu & Schuett, 2014), but has been sparingly applied to wildlife viewing or across ethnoracial

groups. Among BIPOC birders, importance appears to impact participation, but further research has called for investigating these impacts (Fig. 1) (Rutter et al., 2021). Ultimately, these frameworks align to better understand not just patterns of participation in wildlife viewing but also what may encourage participation. This allows us to better understand how best to support BIPOC wildlife viewers in their involvement in wildlife viewing.

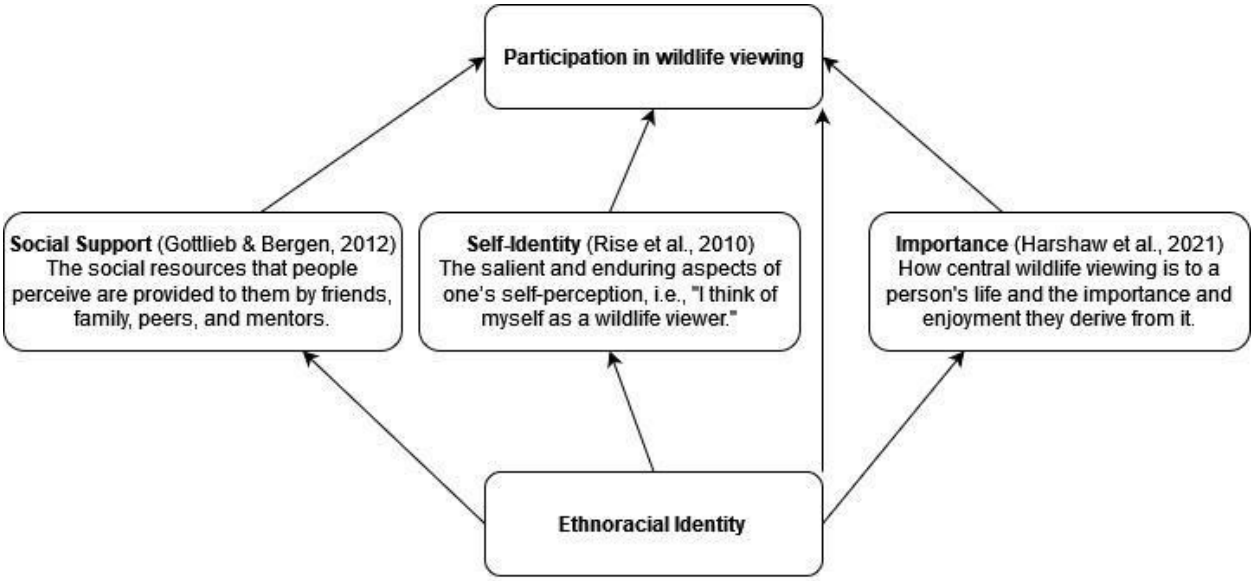

Figure 1. Our combined conceptual framework of social support (Gottlieb & Bergen, 2012), self-identity (Rise et al., 2010), and importance (Harshaw et al., 2021). We examined each framework's association with the extent of participation in wildlife viewing with other frameworks as marginal effects and how ethnoracial identities differed by each framework.

Methods

Survey Design

We conducted a Qualtrics panel survey of wildlife viewers from August to December 2021. Qualtrics maintains a database of individuals who have signed up to participate in panel survey research in exchange for a small financial incentive, and we relied on this database for recruitment. While this database does not necessarily represent the overall US population, with appropriate care and development, like setting demographic quotas, panel surveys are an effective alternative to in-person surveys (Wardropper et al., 2021). Participants in our study were invited directly through emails or application notifications from Qualtrics. To begin, we provided participants with ethical information and prompted them to indicate consent to participate in the study. After consent, we screened for participation in wildlife viewing and ensured all participants were at least 18 years of age (S5). Because our sample was non-probabilistic, we used demographic quotas based on the probabilistic USDOI (2016) National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (US DOI et al., 2016) in an effort to collect a sample that was representative of the broader wildlife-viewing population based on age, gender, and education level. This survey did not report in-depth race and ethnicity data, so

we did not have data upon which we could set an ethnoracial quota, which is a limitation of this work. Meta-analyses of panel surveys have shown that effect sizes do not significantly differ from in-person or mail data (Walter et al., 2019) and that setting quotas makes panel surveys substantially more representative (Lehdonvirta et al., 2021). We instituted time limits and numerous attention check questions like reverse coding to ensure valid responses (see Sinkular et al., 2022, for more details on these methods). We collaborated with a 25-person steering committee of state fish and wildlife agency representatives from various backgrounds across the United States to develop the survey. As the purpose of the steering committee was to ensure that the results would be valuable and relevant to state agencies, we chose members based on their professional experiences. We did not gather the demographics of the committee, so we cannot describe their ethnoracial backgrounds. This is a limitation of our work; future work should consider this in its design. We also reviewed the existing literature (Sinkular, E & Jennings, K, 2021) and adapted several questions from a similar study of wildlife viewers in Virginia, USA, previously conducted by our research group (Grooms, 2021). We conducted two rounds of pilot testing. The first was with a convenience sample of known wildlife viewers. The second round was conducted with a randomly recruited Qualtrics panel that was reasonably diverse in age, gender, income, and ethnoracial identity. After each pilot, we modified questions to increase clarity and reduce the response burden.

We collected survey responses in two stages. First, we collected responses from approximately 1000 respondents in each of the four Association of Fish and Wildlife Agencies (AFWA) regions broadly consisting of the West, Midwest, Northeast, and Southeast regions of the United States. In the second stage, we collected 500-1000 responses each from 15 states across the AFWA regions that opted to receive state-specific sampling. Due to the small sample size for some ethnoracial groups at the national level, we combined all survey responses for analysis, using state of residence as a random effect to ensure differences in participation, culture, and overall recreation behavior among states are accounted for in the model.

We used closed-ended questions asking about wildlife viewing frequency, where people go to view wildlife, identity as a wildlife viewer, the importance of wildlife viewing to one's life, and perceived support. We measured where people view wildlife by asking how many days respondents participated in wildlife viewing within 1 mile of their homes (around-the-home) and more than 1 mile but within their state (away-from-home) in a typical, non-COVID year. This allowed us to understand both location and frequency. We used Harshaw et al.'s (2021) framework to examine centrality, or how important and central wildlife viewing was to respondents' lives (Harshaw et al., 2021). We asked respondents' extent of agreement on a five-point scale (Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Strongly agree) with six statements: 1) "A lot of my life is organized around wildlife viewing," 2) "Wildlife viewing has a central role in my life," 3) "Being a wildlife viewer is an important part of who I am," 4) "People who look like me participate in wildlife viewing," 5) "I feel welcome among other wildlife viewers," and 6) "I teach or mentor others in wildlife viewing." The six statements used to measure centrality comprised an acceptable scale (Cronbach's α = 0.73), so we combined them into a single measure called "Importance." We measured identity with the same bi-polar Likert scale and the statement: "I think of myself as a wildlife viewer (Patton, 2021)." We measured perceived support using Yosso's (2005) social support

framework by asking to what extent Family members, Friends, Mentors, and Peers encourage respondent's participation in wildlife viewing on a 5-point unipolar Likert scale (Not at all, Very little, Somewhat, Quite a bit, A great deal) (Yosso, 2005). The groups comprised a reliable scale (Cronbach's $\alpha = 0.84$), so we combined them into a single measure called "Support." We also asked about gender and ethnoracial identity. We formatted these questions to reflect current best practices as described by Speil et al. (2019) and Jones (2017), respectively (Jones, 2017; Spiel et al., 2019). These included additional gender options (non-binary), allowed people to opt out or self-describe, and combined race and ethnicity into a single question that allowed respondents to select as many ethnoracial categories as appropriate. This research was approved by the Virginia Tech Institutional Review Board (protocol #20-1018). Many additional questions, including those on demographics, accessibility challenges, and expenditures, among others, were asked. Some of these results are described elsewhere (Sinkular et al., 2022; Sinkular et al., 2024). The complete questionnaire can be found in Appendix 1A.

Methods of Analysis

We analyzed the data using the programming language R. We examined race using categories generally based on US Census categories: Asian; Black or African American; Hispanic, Latino, or Spanish; Native American; Another race or ethnicity; and White. "Another race or ethnicity" included those who indicated that they were of some other race and ethnicity, as well as those who identified as Middle Eastern or North African and Native Hawaiian or other Pacific Islander due to limitations on sample size in these groups. We also examined three additional combined categories: Hispanic, Latino, or Spanish and White; Native American and White; and Multiracial. For the first two categories, census data indicate that these populations are substantial ethnoracial communities in the United States (Jones et al., 2021) that are expected to engage in variable patterns of wildlife viewing. For respondents that selected more than one ethnoracial category and did not fit into other substantial subcategories based on US Census data, we created a category, "Multiracial," often called "two or more races."

Using the package "ordinal," we tested how ethnoracial groups, support, identity, and importance affect participation in wildlife viewing and how support, identity, and importance differ among ethnoracial groups (Christensen, 2022). Our models examined the marginal effects of our predictor variables on our response variables (Table 1). To account for regional differences, we treated respondents' state of residence as a random variable. We standardized the continuous predictor variables, resulting in a mean of zero and a standard deviation of one. Initial models included gender and income, but there were insufficient sample sizes of all subgroups (for example, Native American women) to conduct conclusive analyses. Additionally, while income was predictive of some variables, it did not change the outcome for our variables of interest (see Appendix Table 1B). As income is a well-established barrier to participation, we did not include it in this analysis. Our study explored the association between levels of participation and several predictors but did not assess how these predictors are associated with non-participation, which limits the results and conclusions to wildlife viewers.

Table 1. Models and variables used to assess differences in viewing patterns and impacts of support, identity, and importance among ethnoracial groups.

Model	Predictor Variables	Response Variable
Ethnoracial identity and levels of support, identity, and importance associated with around-the-home viewing	White only (Baseline for ethnoracial identity, Binary, 1, 0) Asian only (Binary, 1, 0) Black only (Binary, 1, 0) Latino only (Binary, 1, 0) Latino + White (Binary, 1, 0) Multiracial (Binary, 1, 0) Native American only (Binary, 1, 0) Native American + White (Binary, 1, 0) Another race or ethnicity (Binary, 1, 0) Support (Likert, 1-5) Identity (Likert, 1-5) Importance (Likert, 1-5)	Yearly participation in around-the-home viewing
Ethnoracial factors and levels of support, identity, and importance associated with away-from-home viewing	White only (Baseline, Binary, 1, 0) Asian only (Binary, 1, 0) Black only (Binary, 1, 0) Latino only (Binary, 1, 0) Latino + White (Binary, 1, 0) Multiracial (Binary, 1, 0) Native American only (Binary, 1, 0) Native American + White (Binary, 1, 0) Another race or ethnicity (Binary, 1, 0) Support (Likert, 1-5) Identity (Likert, 1-5) Importance (Likert, 1-5)	Yearly participation in away-from-home viewing
Ethnoracial differences in perceived support	White only (Baseline, Binary, 1, 0) Asian only (Binary, 1, 0) Black only (Binary, 1, 0) Latino only (Binary, 1, 0) Latino + White (Binary, 1, 0) Multiracial (Binary, 1, 0) Native American only (Binary, 1, 0) Native American + White (Binary, 1, 0) Another race or ethnicity (Binary, 1, 0)	Extent of support provided by friends, family, mentors, and peers
Ethnoracial differences in wildlife viewer identity	White only (Baseline, Binary, 1, 0) Asian only (Binary, 1, 0) Black only (Binary, 1, 0)	Extent to which respondents indicate that they

	Latino only (Binary, 1, 0) Latino + White (Binary, 1, 0) Multiracial (Binary, 1, 0) Native American only (Binary, 1, 0) Native American + White (Binary, 1, 0) Another race or ethnicity (Binary, 1, 0)	identify as a wildlife viewer
Ethnoracial differences in wildlife viewing importance	White only (Baseline, Binary, 1, 0) Asian only (Binary, 1, 0) Black only (Binary, 1, 0) Latino only (Binary, 1, 0) Latino + White (Binary, 1, 0) Multiracial (Binary, 1, 0) Native American only (Binary, 1, 0) Native American + White (Binary, 1, 0) Another race or ethnicity (Binary, 1, 0)	Extent to which wildlife viewing is important to the lives of respondents

Results

Overview of Participants

Our sample of wildlife viewers consisted of 17,045 survey respondents who indicated their ethnoracial identity (Table 2). Our respondents identified as Asian (n = 286, 1.7%), Black or African American (n = 1221, 7.1%), Hispanic, Latino, or Spanish (n =813, 4.8%), Hispanic, Latino, or Spanish + White (n= 404, 2.3%), Multiracial (n= 387, 2.3%), Native American (n= 199, 1.2%), Native American + White (n= 241, 1.4%), Another race or ethnicity (n = 224, 1.3%), and White (n = 13270, 77.9%). As this was a survey of wildlife viewers, it is not likely to match the overall ethnoracial demographics of the US. However, comparisons between our sample and US ethnoracial demographics can be found in Appendix Table 1C. The average age of respondents was 49 years. Fifty-two percent of respondents identified as men, 47.5% as women, and 0.6% as non-binary. Sixty-eight percent of respondents had income below the US median of $75,000, indicating that we oversampled lower-income respondents (US Census Bureau, 2021).

Table 2. Sociodemographic information of our sample of wildlife viewers.

Ethnoracial Identity	Asian	1.7%
	Black or African American	7.1%
	Hispanic, Latino, or Spanish only	4.8%
	Hispanic, Latino, or Spanish + White	2.3%
	Multiracial	2.3%
	Native American	1.2%
	Native American + White	1.4%

	Another race or ethnicity	1.3%
	White	77.9%
Age (years)	Mean (SD)	48.9 (17.6)
Gender	Man	52.0%
	Woman	47.5%
	Non-binary	0.6%
Income	Less than $24,999	20.6%
	$25,000 - $49,999	28.3%
	$50,000 - $74,000	19.0%
	$75,000 - $99,999	13.4%
	$100,000 - $124,000	8.5%
	$125,000+	10.3%
Education Level	High diploma, equivalent, or less	29.3%
	Some college	20.9%
	Associate's or technical degree	11.8%
	Bachelor's degree	24.1%

Around-the-home and away-from-home viewing patterns

We found significant differences in around-the-home and away-from-home viewing. When compared to White respondents, most ethnoracial groups participated less in viewing around-the-home (Fig. 2A). Asian respondents reported 64% lower (odds ratio [OR]: 0.36; 95% confidence interval [CI]: 0.28-0.46) participation than White respondents. Black or African Americans reported 56% (OR:0.44; CI: 0.39-0.49), Hispanic, Latino, or Spanish 47% (OR:0.53; CI: 0.46-0.61), Hispanic, Latino, or Spanish + White 42% (OR:0.58; CI: 0.48-0.70), and Multiracial 34% (OR:0.66; CI: 0.54-0.80) lower participation. Native American + White respondents had 30% (OR:1.30; CI:1.02-1.66) higher participation when compared to White respondents. Participation around-the-home was also positively associated with the level of support respondents received from family, friends, mentors, and peers, the extent to which they identified as wildlife viewers, and the importance of viewing to their lives when accounting for ethnoracial identity. Support was associated with a 7% increase in around-the-home participation (OR:1.07; CI: 1.04-1.11) for each standard deviation (equal to 1.03) increase in support, and importance was associated with an 8% increase in participation (OR:1.08; CI: 1.03-1.12) for each one standard deviation (equal to .85) increase. Identity as a wildlife viewer

was associated with a 46% increase in participation (OR:1.46; CI: 1.40-1.50) for each standard deviation (equal to 0.98) increase in identity.

When examining away-from-home viewing behavior, Asian respondents exhibit 32% lower (OR:0.68; CI:0.540-.85) participation compared to White respondents. Black or African Americans showed 16% lower (OR:0.83; CI:0.74-.94) and Hispanic, Latino, or Spanish 20% (OR:0.80; CI:0.70-0.93) lower participation. Native Americans had 32% (OR:1.32; CI:1.01-1.72), and Native American + White had 31% (OR:1.31; CI:1.02-1.67) higher participation in away-from-home viewing compared to White respondents (Fig. 2B). Participation in away-from-home viewing was positively associated with the level of support and identity respondents reported, as well as the importance of viewing to their lives when accounting for ethnoracial identity. Away-from-home participation increased by 47% (OR:1.47; CI: 1.42-1.52) for each standard deviation (equal to 1.03) increase in support. Away-from-home participation increased by 18% (OR:1.18; CI: 1.13-1.22) for each one standard deviation (equal to 0.98) increase in identity and by 49% (OR:1.49; CI: 1.42-1.56) for each one standard deviation (equal to 0.85) increase in importance.

Overall proportions of participation by ethnoracial groups in around-the-home and away-from-home viewing can be found in the Appendix (Tables 1D, 1E).

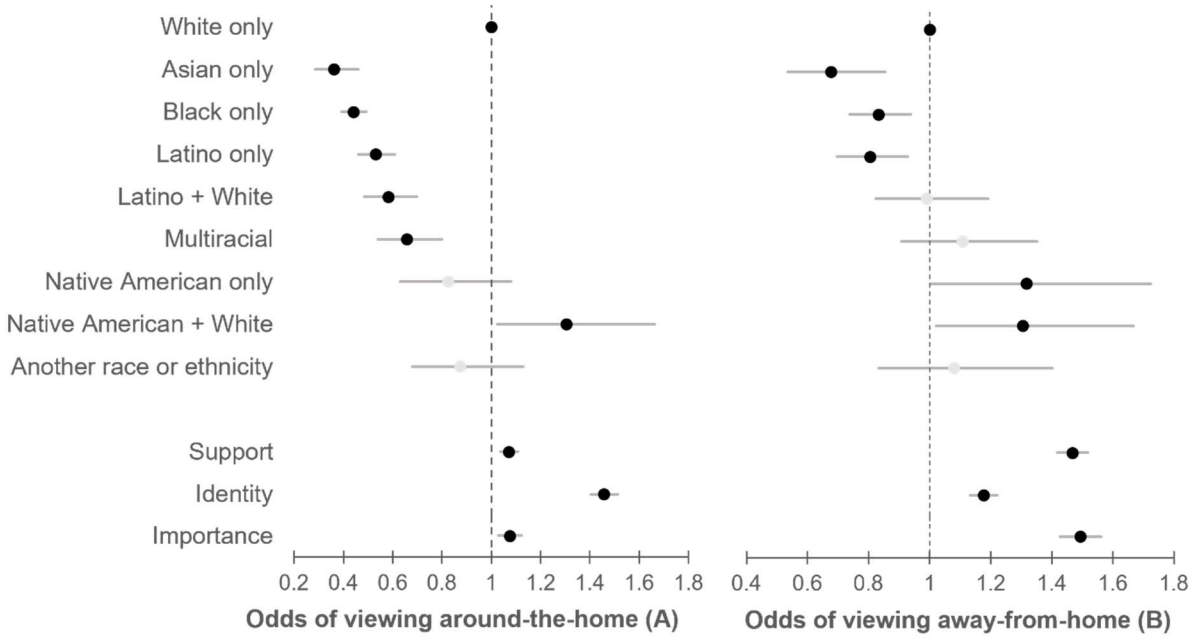

Figure 2. Odds ratios of participation in (A) around-the-home and (B) away-from-home wildlife viewing. The dotted line at 1 indicates the comparison group (White only). Points are the odds ratio and error bars are 95% confidence intervals. Black points indicate statistically significant ratios. A response above 1.0 indicates significantly higher participation, while below 1.0 indicates significantly lower participation.

Support and Ethnoracial Identity

Our results showed that Black or African American respondents indicated 37% higher support from family, friends, peers, and mentors (OR:1.37; CI:1.22-1.53) when compared to White respondents. Hispanic, Latino, or Spanish 71% higher (OR:1.71; CI:1.50-1.95); Hispanic, Latino, or Spanish + White 2.65 times (OR: 2.65; CI:2.19-3.20); Multiracial 41% (OR:1.41; CI:1.17-1.68); and Native American respondents 47% (OR:1.47; CI:1.14-1.89) higher levels of support when compared to White respondents (Fig. 3A).

Identify as a wildlife viewer and the importance of wildlife viewing

We found that Asian respondents were 40% less likely to identify as wildlife viewers (OR:0.60; CI:0.48-0.74) when compared to White viewers. Black or African Americans identified 28% less likely (OR:0.72; CI:0.65-0.81), and Hispanic, Latino, or Spanish 24% less (OR:0.76; CI:0.66-0.87) compared to White respondents. Hispanic, Latino, or Spanish + White respondents exhibit 31% higher levels of identification when compared to White respondents (OR:1.31; CI:1.09-1.58) (Fig. 3B). We also found that Black or African American respondents stated wildlife viewing was 51% (OR:1.51; CI:1.35-1.69) more important to their lives when compared to White respondents. Hispanic, Latino, or Spanish indicated 50% more (OR:1.50; CI:1.35-1.72); Hispanic, Latino, or Spanish + White 2.6 times (OR:2.59; CI:2.15-3.12); Native Americans 80% (OR:1.80; CI:1.39-2.34); Native American + White 27% (OR:1.27; CI:1.004-1.60); and Another race or ethnicity 29% (OR:1.28; CI:1.01-1.64) more important to their lives when compared to White respondents. (Fig. 3C).

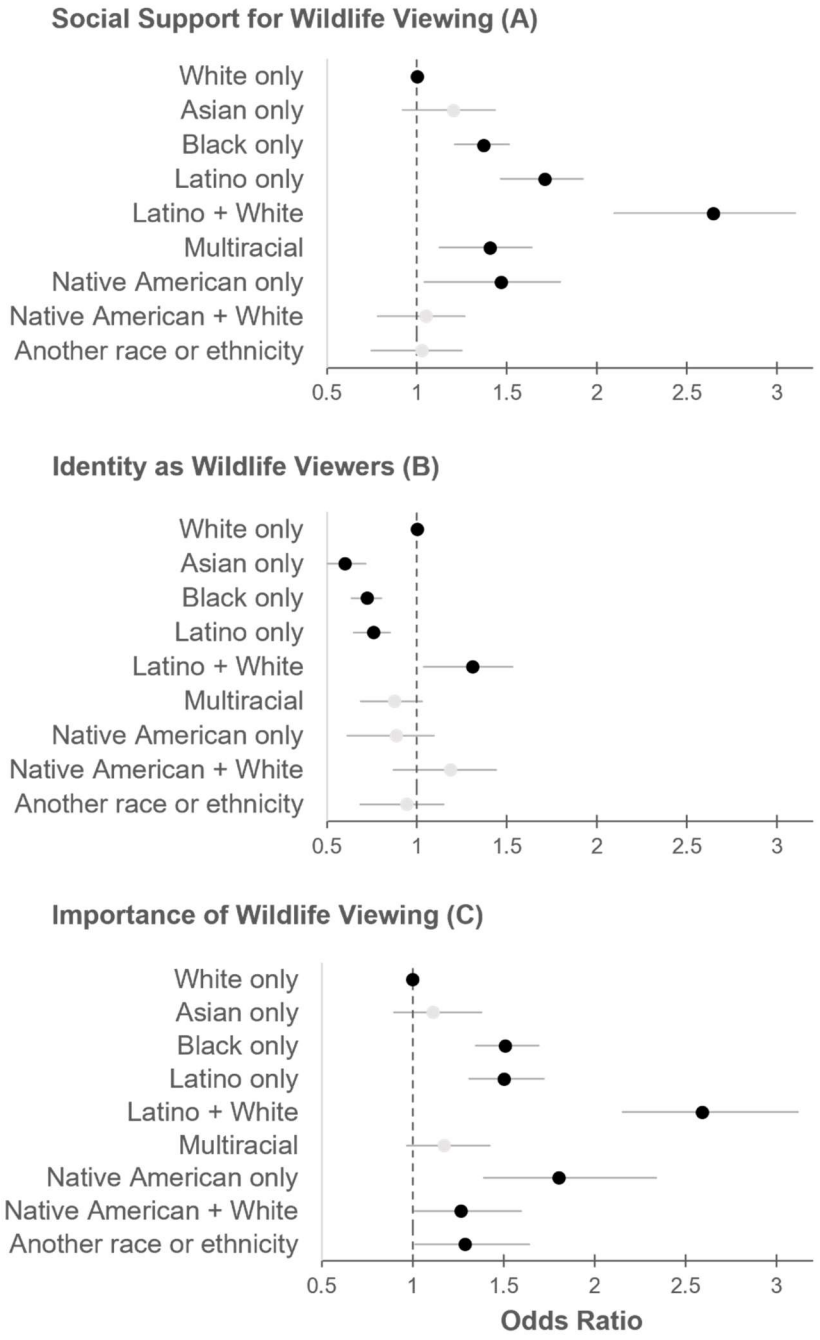

Figure 3. Odds ratios of (A) support for viewing, (B) identity as a viewer, and (C) importance of viewing. The dotted line at 1 indicates the comparison group (White only). Points are the odds ratio and error bars are 95% confidence intervals. Black points indicate statistically significant ratios. A response above 1.0 indicates significantly higher participation, while below 1.0 indicates significantly lower participation.

Discussion

Our results suggest that BIPOC wildlife viewers differ from their White counterparts and vary in support, identity, importance, and participation patterns. Generally, they relied more on personal support structures to participate, especially away-from-home. All survey participants engage in some form of wildlife viewing, but Asian, Black or African American, and Hispanic, Latino, or Spanish respondents hesitated to consider themselves "wildlife viewers" despite fitting the description. As self-identification increases, so does participation, especially around one's own home. Further, we found that many BIPOC respondents report wildlife viewing is a more integral part of their lives when compared to White viewers. These results have implications for increasing our understanding of the underlying facilitators of wildlife viewing participation among BIPOC participants. Deepening this understanding can also give program managers tools to create more inclusive and equitable wildlife viewing programming.

Around-the-home and away-from-home viewing patterns

We observed substantial variation in the wildlife viewing behaviors and representation of ethnoracial groups. We found that Asian, Black or African American, and Hispanic, Latino, or Spanish respondents engaged in less wildlife viewing around and away from their homes when compared to White viewers. These differences among ethnoracial groups in their engagement with wildlife viewing may be due to negative cultural histories. For example, historical factors like enslavement and Jim Crow segregation may discourage Black participants from participating in wildlife activities (Johnson & Bowker, 2004). Similarly, for Latine participants, the outdoors may be viewed as a place of labor instead of leisure (Wald, 2022). Additionally, Asian participants may avoid outdoor activities due to legacies of indentured and forced labor (Chiang, 2010; Narváez, 2019). These factors likely influence engagement with wildlife viewing in unique ways, and further research is needed to understand these impacts on a deeper level.

Native American respondents engaged at similar or greater rates of wildlife viewing both around and away from their homes compared to White viewers. These findings support previous research showing that Native Americans participate in wildlife viewing at higher rates (Rutter et al., 2021). Additionally, differences between Native Americans and other ethnoracial groups are likely influenced by the vastly different cultural relationships that Native Americans have with nature and outdoor recreation (Fox, 2015). Indigenous cultures in the United States and globally often have relational kinships with nature, not viewing nature as a separation from community and individuals but rather integrated as a relative (Fox, 2015; Moreton-Robinson, 2003).

These results highlight distinct differences among BIPOC groups. They also suggest that some BIPOC communities, namely Asian, Black, and Hispanic, Latino, or Spanish, have lower immediate access to high-quality green spaces and other places to view wildlife (Robinson et al., 2023). Ethnoracial segregation such as this is seen across North America, Europe, and Australia (Byrne, 2012; Hoffimann et al., 2017; Kronenberg et al., 2020). While other studies have shown how policies such as gentrification across the world and redlining in the US affect communities' availability of green spaces (Kronenberg et al., 2020; Nardone et al., 2021), our study suggests that such policies may affect people's ability to recreate around their homes. If BIPOC viewers have lower access to viewing sites near their homes, they must travel further to

participate in viewing. Accessing these sites takes more time, money, and resources, which is likely to reduce the level of participation and the likelihood of starting to view wildlife. Increasing access pathways by creating more green spaces in BIPOC neighborhoods and making existing spaces more easily accessible (i.e., through more transportation options like buses) can reduce this burden and more effectively support participation (Arakaki et al., 2019).

Support and Ethnoracial Identity

Most BIPOC respondents in our study indicated that they receive higher levels of support than White respondents to participate in wildlife viewing, especially away from their homes. This affirms the significant role of social connections and support structures in encouraging initial and continued participation in wildlife viewing. Our results suggest that BIPOC respondents, namely Black or African American, Hispanic, Latino, or Spanish, Hispanic, Latino, or Spanish + White, multiracial, and Native American respondents, may be relying on forms of community social capital (Yosso, 2005) to engage in wildlife viewing and that these support structures likely differ from those utilized by White respondents. Many studies examining BIPOC participation in outdoor recreation focus on existing barriers and suggest that eliminating barriers would increase participation. Still, our results show that building support is integral to sustained involvement, especially away from one's home. Likely, BIPOC viewers who receive support from friends, mentors, etc., are more able to effectively navigate the culture of wildlife viewing (Bagheri Hamaneh, 2024), which has historically been a White activity, both within the US and globally (Cashman-Brown, 2012; Castley, 2018). Building frameworks that allow for better direct support (i.e., mentorship programs and BIPOC-specific wildlife viewing events) is critical to encourage more direct connections to nature. Building support is a yet underexplored aspect of nature connectedness, but research showing the importance of social support for BIPOC communities (Yosso, 2005) and the success of BIPOC-specific organizations in the US, such as Outdoor Afro and Latino Outdoors, suggests that organizations providing this direct support may be contributing to increased engagement (Castillo, 2022; Taylor, 2022). Higher levels of nature connectedness are linked to increased well-being and higher participation in pro-environmental behaviors (Whitburn et al., 2020), suggesting that wildlife viewing is beneficial not just for human health but also for overall ecological health.

Identify as a wildlife viewer and the importance of wildlife viewing

We found that many BIPOC respondents expressed less self-identification as wildlife viewers despite indicating that wildlife viewing is as or more important to their lives when compared to White viewers. As our results show that participation increases with self-identification and importance, they suggest the relevance of identity theory and theories of importance in explaining diverse participation in wildlife viewing. Additionally, we see similar trends with environmentalism, showing that while Black, Indigenous, and people of color tend to be more concerned about environmental issues than White people, they do not consider themselves to be environmentalists (Pearson et al., 2018). Previous work also shows that racial groups have similar levels of specialization in wildlife viewing (specifically birding), so a lack of self-identity may not be due to a lack of experience (Rutter et al., 2021). Lower rates of identification may be due, in part, to a lack of representation of wildlife viewers who share their

identities both as seen participating in wildlife viewing and in advertisements or social media posts related to wildlife viewing (Finney, 2014; Roberts & Henderson, 2016). Legacies of inequity like White-only parks in the US and gated green spaces in Europe disallowed Black, Indigenous, and people of color to meaningfully participate in outdoor recreation and wildlife viewing due to implicit and explicit exclusion, much of which still exists today (Finney, 2014; Kronenberg et al., 2020). This history of exclusion still impacts communities of color in their pursuit of outdoor recreation (Floyd et al., 2016; Hoffimann et al., 2017). To create programs and environments that are inclusive and equitable, organizations providing wildlife viewing programs could work to unlearn Westernized concepts of nature. To do so, they could partner with community groups to better understand local contexts and alter programs to meet community groups where they are. Additionally, some research has suggested that increased representation in careers, communications, and events can promote the internalization of outdoor recreation and environmentalist identities (Bowden, 2021; Finney, 2014; Pearson et al., 2018; J. C. Robinson, 2005), but more research is needed to understand how identity is shaped and encouraged among communities of color.

Compared to other large-scale research on wildlife viewers (US DOI et al., 2016), our sample showed a more significant proportion of BIPOC respondents participating in wildlife viewing. It also examined ethnoracial groups not previously included in wildlife viewing research. Our findings support the growing body of literature showing that BIPOC participants are underrepresented in wildlife viewing when compared to their proportion of the US public (Arakaki et al., 2019; Finney, 2014; Floyd et al., 2016; Rutter et al., 2021). While research suggests that the gap is beginning to close (US Department of the Interior et al., 2001, 2016), White respondents continue to dominate wildlife viewing spaces disproportionately (Castley, 2018). As global demographics change and we reckon with legacies of exclusion, supporting BIPOC wildlife viewers is a first step in diversifying wildlife viewing. Understanding how to encourage and uplift BIPOC participants in outdoor recreation is vital to meeting the needs of a changing public. We recommend that future research examine BIPOC communities specifically. While we were able to capture the largest proportional sample of BIPOC participants yet, small sample sizes in some groups limited our ability to examine intersectionality, such as patterns for women of color. Future studies should be developed with intersectionality in mind. As more Black, Indigenous, and people of color develop an interest in wildlife viewing, it is essential to increase pathways that foster meaningful engagement in wildlife viewing to ensure continued engagement with nature and the environment and overall health and wellness. In turn, these relationships with nature are likely to foster care for environmental issues (Cooper et al., 2015), which is especially important as we face the impacts of industrialization, urbanization, and a changing climate.

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Chapter 2: How Expectations of Reciprocity Impact Donation and Volunteer Behavior to Nongame Wildlife Programs: A Case Study in Minnesota

Abstract

Understanding the motivations driving support for conservation efforts, particularly through volunteering and donations, is crucial for the sustainability of conservation organizations. While previous studies have explored general volunteer and donation behavior, this research focuses on motivations specific to nature-based support. We examined the Minnesota Department of Natural Resources Nongame Wildlife Program (MNDNR NWP) as a case study to discern the motivations behind volunteer and donor behaviors. Using a survey methodology, we collected data from 763 respondents recruited through the MNDNR NWP's email list and Facebook page. Our analysis revealed significant associations between motivations and past and future volunteer and donation behaviors. Specifically, motivations related to biodiversity and ecological reciprocity emerged as strong drivers of donor behavior, indicating a preference for supporting conservation efforts. In contrast, motivations based on personal reciprocity were not significantly associated with increased donor behavior. For volunteers, perks and natural place-based motivations were strongly linked to past and future engagement, while personal place-based motivations were particularly influential among those with prior volunteering experience. These findings suggest a broad interest in wildlife conservation beyond organized events, extending to local communities and private lands. Our results underscore the importance of aligning volunteer experiences with preferred motivations to sustain engagement. We propose that integrating community science programs, which effectively activate volunteer motivations, could enhance engagement and support for conservation efforts. By focusing on the conservation impact of contributions and broadening strategies for donor and volunteer engagement, conservation organizations can adapt to the changing landscape and foster long-term support for wildlife conservation.

Introduction

Nongame Wildlife Programs (NWPs) are instrumental in protecting rare and vulnerable wildlife species across the United States. In the state of Minnesota alone, the Minnesota Department of Natural Resources (MNDNR) NWP is responsible for monitoring, protecting, and sustaining more than 2000 nongame species (federally defined as wild vertebrate animals that are federally listed as threatened or endangered species, marine mammals, or not ordinarily taken for sport, fur, or food (Nongame Act, 1980)). Yet, many NWPs have limited budgets that struggle to support the scope of their work. To combat this, NWPs rely on more stable and substantial funding streams from both federal programs and the public (Eubanks & Wyckoff, 1989; Ferguson, 1990; Thompson, 1987). For many NWPs, donations from the public account for a substantial majority of their year-to-year funding (Kendrick et al., 2012). Despite their importance to nongame conservation, NWPs and those supporting them remain understudied subjects within state fish and wildlife agencies (hereby, state agencies). Understanding how and why the public engages with these programs is crucial to ensure their long-term success.

Since their inception in the 1980s, a majority of research on NWPs studied the general demographics of donors (e.g., Eubanks & Wyckoff, 1989; Johnson & Manfredo, 1989) and how

these demographics predict future donations (e.g., (Harris et al., 1992), but no research known to the authors examined the motivations that encourage financial support. While demographic information and previous behavior can predict future support, it cannot describe underlying support mechanisms and struggles to meaningfully inform actions that will better engage the public. To encourage the public to support NWPs, research must go beyond demographics to understand what motivates these behaviors (Asah & Blahna, 2012).

In addition to financial support, many NWPs rely on volunteers to sustain conservation efforts through community science. Community (also called citizen) science is the inclusion of the general public in some aspect of scientific research, usually in collaboration with or under the direction of professional scientists and institutions (Eitzel et al., 2017). State agencies often employ a community science approach because it allows for the development of large, wide-reaching datasets that can inform management decisions (McKinley et al., 2017; Shirk et al., 2012) and build stronger relationships between state agencies and their constituencies (Crain et al., 2014; Newman et al., 2017). Yet, research that examines motivations in conservation volunteering contexts is limited (e.g., (Caissie & Halpenny, 2003; Domroese & Johnson, 2017), and none known to the authors examine NWPs specifically. Some research suggests that people's participation in volunteering is encouraged and/or dependent on their motivations being fulfilled; for example, if someone is motivated to volunteer to gain access to professional advice but is not given an opportunity to receive that advice, they may not participate in the activity again (Clary & Snyder, 1999). Additionally, motivations can vary greatly between different people and often cannot be simply classified as altruistic (benefiting others) or egoistic (benefiting oneself) (Clary & Snyder, 1999; Veludo-de-Oliveira et al., 2015). Despite research in other disciplines showing that the motivations for financial donations differ from those that impact volunteer support (Bendapudi et al., 1996; Sojka, 1986), NWP-specific research to date often conflates the two, studying the dynamics of financial support and generalizing these results to explain all engagement with NWPs (e.g., (Ferguson, 1990; Johnson & Manfredo, 1989). Research that parses out motivations for these different kinds of support is greatly needed to understand how to engage with a wide range of constituents that have different preferred methods of engagement (Mangun & Shaw, 1984; Telg et al., 2012).

Frameworks for donation and volunteer motivations

We will use frameworks rarely applied in conservation research to inspect motivations for donation and volunteer behavior. For donation behavior, we will use a novel application of reciprocity theory (Belk, 1976; Egan, 1988; Kimmerer, 2011), building on previous work with the study population (Jennings et al., 2024). For volunteer behavior, we will apply a novel application of the theory of reciprocity (Belk, 1976; Egan, 1988; Kimmerer, 2011) and the motivations for volunteering for nature framework (Caissie & Halpenny, 2003).

Reciprocity

Reciprocity, or the expectation to receive materials, physical or otherwise, in return for donations or volunteering, has primarily been explored through personal perspectives, or what a supporter gets from their participation, like more knowledge or a chance to experience unique natural areas (e.g., (Belk, 1976; Caissie & Halpenny, 2003). However, it can also be examined from an ecological and community perspective, where reciprocity is framed in terms of

caregiving and responsibility to the earth and its inhabitants, including other people (Egan, 1988; Kimmerer, 2011). For example, when people support conservation, do they expect the agencies they support to increase or maintain biodiversity? Make a better world for their children? Improve environments that better support different types of wildlife recreation? Donations and volunteering have not yet been examined using the reciprocity framework. Still, emerging research in similar fields (e.g., ecological restoration and using traditional ecological knowledge for land management) has shown that it likely influences supporters' participation in voluntary action. This research has promising implications for increasing financial and volunteer support for wildlife management agencies (Burnett et al., 2019; Kimmerer, 2011; Ludwig & Macnaghten, 2020; Singh, 2015), and we assess its implications among volunteers and donors to the MNDNR NWP.

Motivations for Volunteering for Nature

Research on general volunteer behavior describes diverse motivations for volunteering. Volunteering for nature has not been extensively studied, so we rely on Caissie and Halpenny's (2003) five motivations that encourage volunteerism for nature (Table 1) (Caissie & Halpenny, 2003). This study specifically examined participants engaging in conservation volunteering programs that aimed, albeit indirectly, to benefit nongame species on a variety of lands. To date, this framework has primarily been applied to nature-based volunteering within the context of ecotourism (e.g., (Ocanas, 2019; Tomazos, 2010). We expand its use to examine nature-based volunteerism in support of wildlife conservation through a state agency. We use this framework to determine if particular motivations are more salient than others for NWP volunteers. We will also apply reciprocity theory to this framework by classifying each motivation within a type of reciprocity to determine if certain types are more motivating for volunteering.

Table 1. Caissie & Halpenny (2003) Motivations for Volunteering for Nature

Motivation	**Definition, personal (P), community (C), ecological (E) reciprocity**
Pleasure-seeking	How participants get enjoyment from the experience, e.g., have fun and spend time with like-minded people (P)
Perks	What participants may receive in return from the experience, e.g., access to professionals or opportunities to learn new things (P)
Place	Which locations participants access through the experience. We will consider two types, "personal," e.g., lands owned or important to respondents, and "natural" e.g., lands that are ecologically interesting or unique (E, P)
Legacy	How the experience can provide lasting impacts, e.g., for future generations (C)
Altruism	How the experience cares for nature and people, e.g., volunteering for nature because it is "the right thing to do" (E)

Ultimately, this research aims to understand what most motivates donors and volunteers to support the MNDNR NWP. Because NWPs rely on federal and public funding in addition to operating under the authority of a state agency, we predict that the drivers of these behaviors will be unique for NWPs, differing from both non-governmental organizations and state agencies as a whole. We expect that people engaged with NWPs will be more interested in ecological forms of reciprocity, such as increased biodiversity and habitat restoration, instead of more personal forms, like having fun or receiving gifts for their support.

Methods

Minnesota Department of Natural Resources Nongame Wildlife Program

The MNDNR NWP was created in 1977 and became one of the first states to pass legislation allowing voluntary donations through a tax checkoff beginning in 1981. In 1982, Eubanks and Wyckoff conducted foundational research on donors to NWPs using the MNDNR NWP as a case study (Eubanks & Wyckoff, 1989). The MNDNR NWP receives over three million dollars annually in donations from the public through tax checkoffs, critical habitat license plates, and direct contributions (MNDNR NWP, 2021). Their program is well-established and has a sizeable following, including more than 44,000 Facebook followers and 1500 email list members (MNDNR NWP, personal communication, 2022). Additionally, their outreach (including live-streaming wildlife cameras) reaches tens of thousands of Minnesotans annually. Despite this, they have seen declining numbers of donors over the last decade. At the same time, they are expanding their volunteer programs to better engage more Minnesotans while collecting valuable species data (MNDNR NWP, 2021). As they sit at this critical juncture of decreasing donors and program changes, they closely resemble many other NWPs striving to remain relevant to a changing constituency (Decker et al., 2016).

Survey Design

Using a QuestionPro questionnaire, we examined (i) past experiences donating to or volunteering with the MNDNR NWP and (ii) how these support behaviors and motivations were associated with future support behaviors. The questionnaire was built upon previous research (Grooms et al., 2020; Sinkular et al., 2022) and asked primarily closed-ended questions. We included questions about previous donation and volunteer behavior, motivations for donating and volunteering, and many other questions related to outdoor recreation, civic engagement, and familiarity with the MNDNR NWP (The complete survey is in Appendix 2A). We measured motivations for volunteering based on Caissie and Halpenny's (2003) framework and assessed on a five-point Likert scale of likelihood (Not at all, Slightly, Moderately, Very, Extremely) to volunteer with programs that fulfill each motivation: pleasure-seeking, perks, place, legacy, and altruism. We examined donation behavior using the same framework in addition to foundational focus groups (Jennings et al., 2024) using the previously-mentioned five-point Likert scale of likelihood. We also asked general demographics such as age, gender, race, household income, education, and familiarity with the MNDNR NWP on a five-point scale from Not at all to Extremely. We formatted gender and race based on current best practices by Spiel et al. (2019)

for gender and Jones (2017) for race (Jones, 2017; Spiel et al., 2019). For gender, we offered respondents the choice to identify their gender as man, woman, or non-binary, with a space to self-describe their identity or decline to provide. We followed census categories for race but allowed respondents to select as many categories as they felt described them. To measure future intent to volunteer, we asked participants on a five-point scale how likely they were to: 1) "Inform or teach others about the conservation of nature," 2) "Collect data on wildlife or habitat through a website or phone application," or 3) "Collect data on wildlife or habitat through an in-person event." Using the same scale to measure future intent to donate, we asked how likely participants were to make the following contributions to the MNDNR NWP: 1) "Minnesota Critical Habitat license plate," 2) "Voluntary donation of a portion of state income or property tax return," or 3) "Direct Donation." This research was approved by and conducted per the Virginia Tech Institutional Review Board (protocol #21-850).

Survey implementation

From September to November 2022, we administered the survey using the Dillman method, with an initial recruitment email or sponsored Facebook post, followed by up to three reminders (Dillman, 2014). Participants in our study were recruited from the MNDNR NWP's email list and through sponsored posts on their Facebook page. We provided participants with ethical information and prompted them to indicate consent to participate in the study. After consent, we ensured all participants were at least 18 years of age and at least part-time residents of the state of Minnesota. To limit responses from people unassociated with the MNDNR NWP, we also asked respondents to indicate where they had been prompted to participate in the survey, as we were aware that some organizations had shared our post. We compared demographics between those we determined as associated (recruited from the MNDNR NWP Facebook or email) and those unassociated. We found that the groups differed demographically and in their familiarity with the NWP. As these two groups reasonably differed, all respondents who indicated sources aside from the email list and Facebook page were removed from this analysis.

To test for nonresponse bias, we sent an additional, shortened follow-up survey in December 2022 to members of the email list who did not respond to the initial survey recruitment. The follow-up included questions about demographics, volunteer and donation behavior, and general familiarity. We used chi-square tests of independence to determine if these two groups differed.

Methods of analysis

Using IBM SPSS Statistics (Version 28), we conducted binomial logistic regressions to determine if particular motivations were more associated with volunteer and donation behavior (IBM Corp, 2021). We created two variables to capture past volunteer and donation behavior, for which any documented behavior is accounted (1 for any behavior, 0 for no behavior). Past volunteers indicated they had participated in any volunteer behavior and past donors for any donation behavior. For future behavior, if a participant selected "Very likely" or "Extremely likely"

to participate in any future volunteer or donation behavior, we considered them a future volunteer or donor. Some volunteer motivations, namely those related to place, were highly correlated with one another, so we split them into two separate models.

Results

Our sample consisted of 763 respondents recruited through the MNDNR NWP email list (n=501) and Facebook page (n=262). Respondents were, on average, 59 years old, overwhelmingly women (70%), highly educated (69% having at least a Bachelor's degree), and with a higher income than the average household (more than 58% making more than $75,000/year). These groups had similar demographic information and only significantly differed in age distribution. Respondents recruited through email were older than those recruited through social media ($\chi 2 = 28.79$, df = 6, p = <.001).

Our nonresponse sample consisted of 114 respondents and did not significantly differ from our full sample, except for past donation behavior. Respondents to the nonresponse survey had less previous donation behavior than our complete survey ($\chi 2 = 4.18$, df = 1, p = <.041). Our sample may skew towards people who are already more likely to volunteer or donate, but understanding these groups provides valuable context for understanding donors and volunteers.

Supplementary Table 1

		Social media (n=262)		**Email (n=501)**		**Total Sample**	
		Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
Age*	18-27	15	5.7%	10	2.0%	25	3.3%
	28-37	29	11.1%	49	9.8%	78	10.2%
	38-47	33	12.6%	56	11.2%	89	11.7%
	48-57	50	19.1%	56	11.2%	106	13.9%
	58-67	70	26.7%	134	26.7%	204	26.7%
	68-77	55	21.0%	144	28.7%	199	26.1%
	78+	10	3.8%	52	10.4%	62	8.1%
Gender	Man	61	27.5%	128	28.1%	189	27.9%
	Woman	149	67.1%	312	68.6%	461	68.1%
	Nonbinary	4	1.8%	3	0.7%	7	1.0%

	Prefer not to answer	8	3.6%	12	2%	20	2.9%
Race	White	213	97.3%	437	97.3%	650	97.3%
Income	<$25,000	10	4.5%	16	3.6%	26	3.4%
	$25,000-$49,999	29	13.1%	46	10.2%	75	9.8%
	$50,000-$74,999	44	19.9%	80	17.8%	124	16.3%
	$75,000-$99,999	33	14.9%	62	13.8%	95	12.5%
	$100,000-$124,999	23	10.4%	69	15.3%	92	12.1%
	$125,000+	37	16.7%	89	19.8%	126	16.5%
	Prefer not to answer	45	20.4%	88	19.6%	133	17.4%
Education	High school diploma, equivalent, or less	14	6.4%	27	6.1%	41	5.4%
	Some college	37	16.8%	51	11.5%	88	11.5%
	Associate's or technical degree	31	14.1%	47	10.6%	78	10.2%
	Bachelor's degree	73	33.2%	162	36.4%	235	30.8%
	Professional, master's, or doctoral degree	65	29.5%	158	35.5%	223	29.2%
Residence Size	<2,500	63	28.5%	69	15.3%	132	17.3%
	2,500-9,999	39	17.6%	50	11.1%	89	11.7%
	10,000-49,999	47	21.3%	108	24.0%	155	20.3%
	50,000+	72	32.6%	223	49.6%	295	38.7%

Table 1. Demographic information of the sample separated by those recruited through email and social media. Age was the only demographic that significantly differed between the social media and email-recruited groups (p=<.001).

Donations

Past behavior

We found significant differences in motivations associated with past donation behavior. Respondents motivated by biodiversity, e.g., explicitly contributing to efforts to support biodiversity, were 40% more likely (OR: 1.40; CI:1.08-1.80) to have donated in the past (Fig 1). Additionally, as familiarity (OR: 1.75; CI:1.39-2.20), level of schooling (OR: 1.34; CI:1.12-1.62), and age (OR: 1.44; CI:1.24-1.68) increase, so do the odds that a respondent has donated in the past (Fig 1). Other motivations, like receiving information, having a positive community impact, and having the respondent's name on a physical item or in a directory, were not significantly motivating.

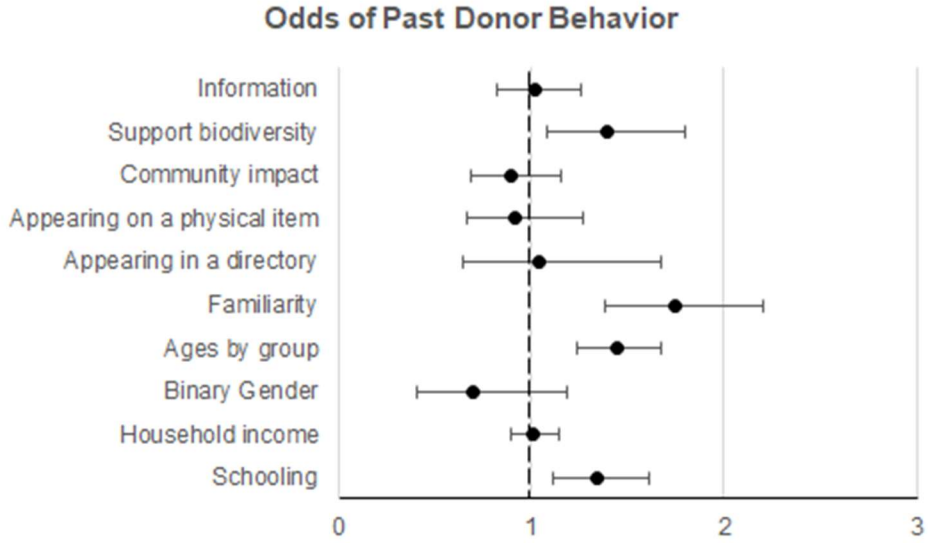

Figure 1. Odds ratios of motivations associated with past donation behavior. Points indicate the odds ratio and error bars are 95% confidence intervals. Points with error bars completely above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

Future behavior

For both respondents who had not previously donated and those who had, specific motivations were more associated with future intent to donate than others. Respondents who were motivated by biodiversity efforts were 2.28 times more likely (OR: 2.28; CI:1.17-4.43) to have a future intent to donate if they had not previously donated (Fig 2), and 75% more likely if they had previously donated (Fig 2). For respondents who have previously donated, higher familiarity (OR: 1.48; CI:1.12-1.95) and household income (OR: 1.16; CI:1.002-1.36) were associated with an increase in their future intent to donate (Fig 2). Other motivations, like

receiving information, having a positive community impact, and having the respondent's name on a physical item or in a directory, were not significantly motivating. (Fig 2).

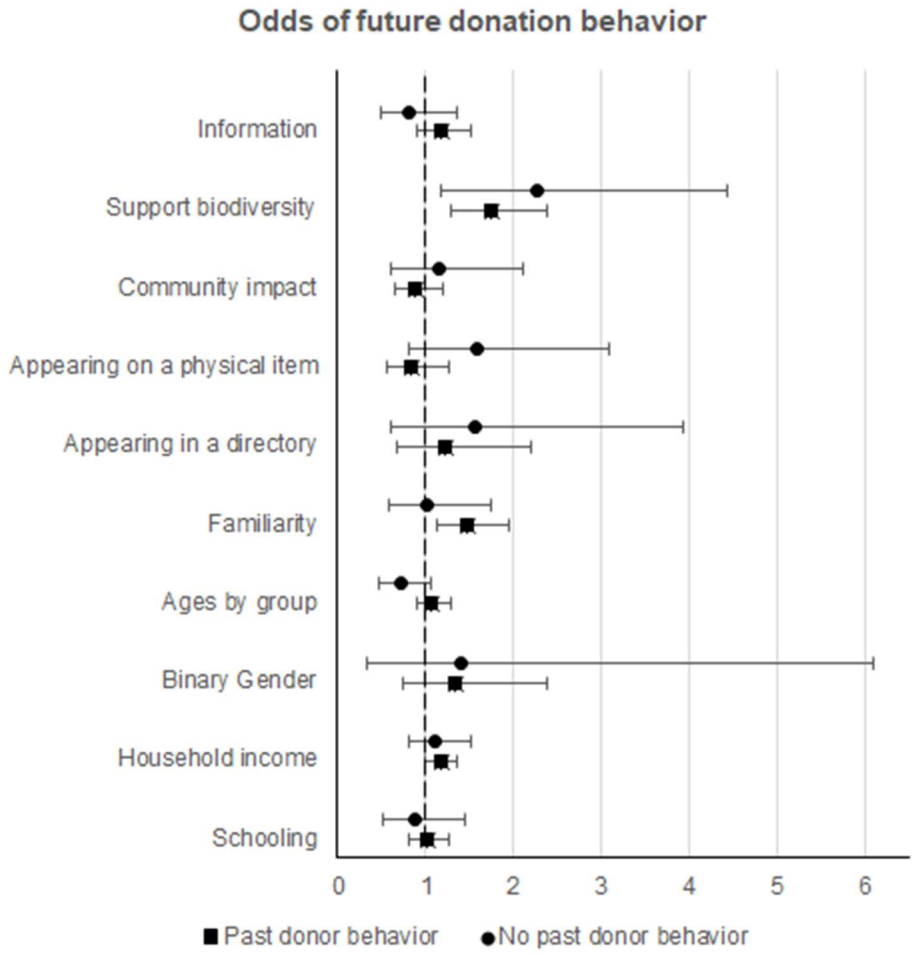

Figure 2. Odds ratios of motivations associated with future donation behavior. Square points indicate respondents who have previously donated; circular points indicate those who have not. Points indicate the odds ratio, and error bars are 95% confidence intervals. Points with error bars above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

Volunteering

Past behavior

We found significant differences in motivations associated with past volunteer participation. Respondents who were motivated by Perks like "receiving access to professionals who can answer their questions" were 56% more likely (OR: 1.56; CI: 1.24-1.97) to have volunteered (Fig. 3). Those who were motivated by Place-based programs for state lands like getting access to interesting ecological places, were 37% more likely (OR: 1.37; CI: 1.09-1.72) to have volunteered (Fig. 4). Additionally, more schooling was associated with increased

volunteer behavior (OR: 1.20; CI: 1.03-1.40; OR: 1.23; CI 1.06-1.43), and higher income was associated with a slight decrease in volunteer behavior in Fig 1 (OR: 0.90; CI: 0.81-0.99). Programs that activated pleasure-seeking, personal place-based, legacy, and altruism motivations were not significantly motivating.

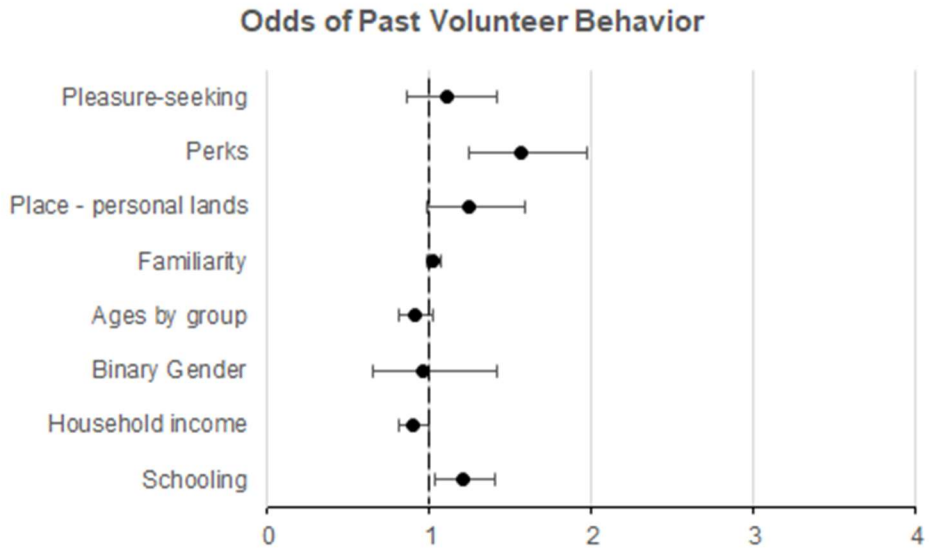

Figure 3. Odds ratios of motivations associated with past volunteer behavior. Points indicate the odds ratio, and error bars are 95% confidence intervals. Points with error bars above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

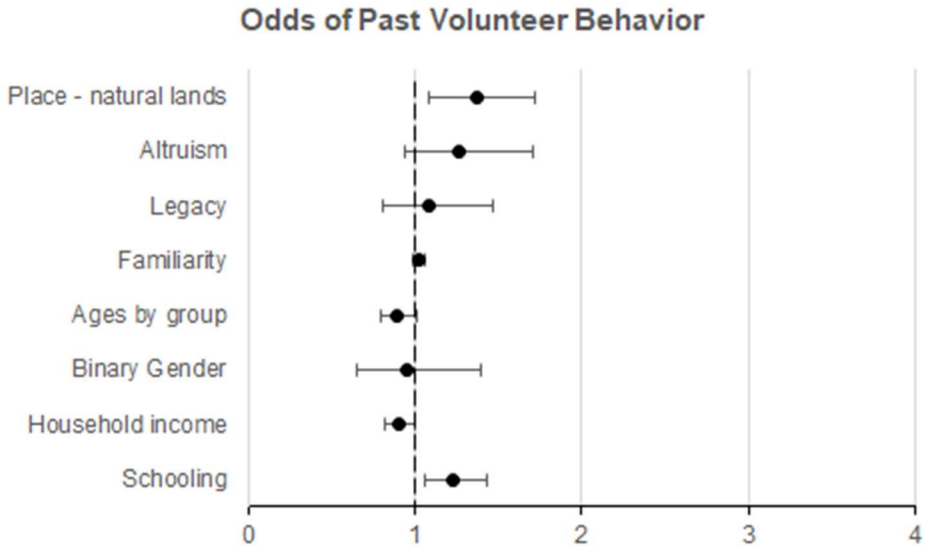

Figure 4. Odds ratios of motivations associated with past volunteer behavior. Points indicate the odds ratio, and error bars are 95% confidence intervals. Points with error bars above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

Future behavior

For both respondents who had not previously volunteered and those who had, specific motivations were more associated with future intent to volunteer than others. Respondents who were motivated by personal place-based programs were 73% more likely (OR:1.73; CI:1.19-2.51; Fig 6) to have a future intent to volunteer if they had not previously volunteered and 2.13 times more likely (OR:2.13; CI:1.35-3.36, Fig 6) if they had previously volunteered. For both groups, higher age was associated with a decrease in a future intent to volunteer (OR: 0.81; CI:0.66-0.99; Fig 5; OR:0.69; CI:0.55-0.87; OR:0.71; CI:0.57-0.90; Fig. 6).

For respondents who did not have previous volunteer experience, those motivated by perks were 50% more likely (OR:1.50; CI:1.03-2.19; Fig 6) to have a future intent to volunteer. Those who were motivated by legacy, e.g., preserving the environment for future generations, were 67% more likely (OR:1.67; CI:1.09-2.56; Fig 7), and those who were motivated by place-based programs for state lands were 42% more likely (OR:1.42; CI:1.03-1.97) to have a future intent to volunteer. Programs that activated pleasure-seeking and altruism motivations were not significantly motivating.

For people who have previously volunteered, no motivations aside from the aforementioned place-based personal lands programs were significantly motivating. Women were 2.22-2.47 times more likely to express a future interest in volunteering when compared to men (OR: 2.22; CI:1.05-4.67; Fig 5; OR: 2.47; CI:1.20-5.08; Fig 6).

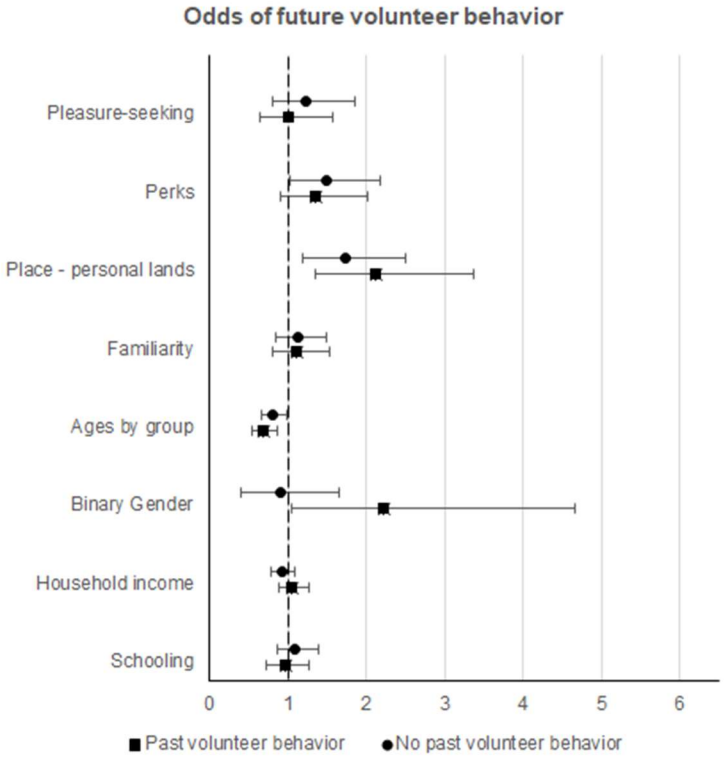

Figure 5. Odds ratios of motivations associated with future volunteer behavior. Square points indicate respondents who have previously volunteered, and circular points indicate those who have not. Points indicate the odds ratio, and error bars are 95% confidence intervals. Points with error bars above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

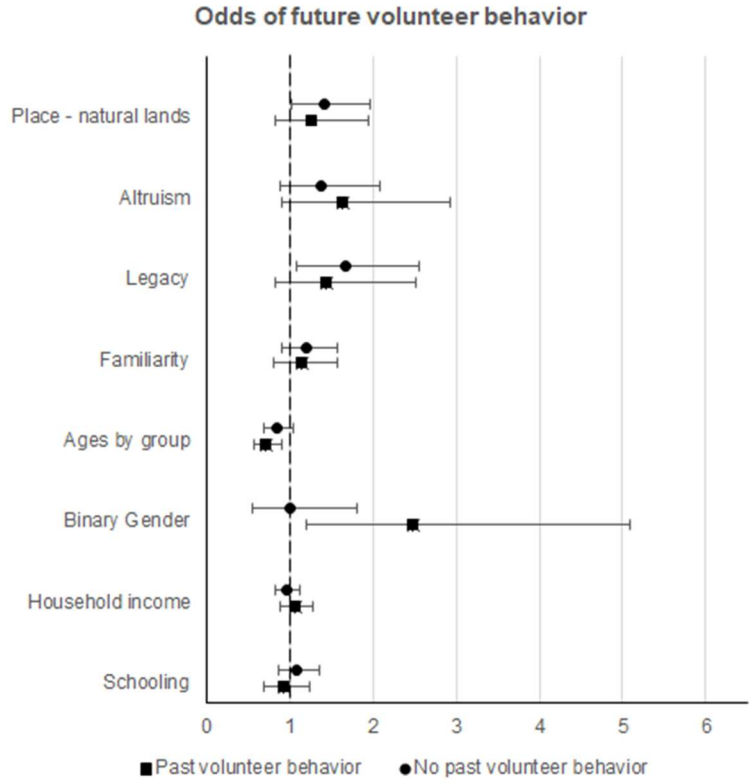

Figure 6. Odds ratios of motivations associated with future volunteer behavior. Square points indicate respondents who have previously volunteered, and circular points indicate those who have not. Points indicate the odds ratio, and error bars are 95% confidence intervals. Points with error bars above 1.0 indicate significantly higher participation, while below 1.0 indicates significantly lower participation.

Discussion

Our findings suggest that support from donors and volunteers is associated with particular conservation-based motivations. Ecological reciprocity appears to be highly important to donors based on their preference to support biodiversity and conservation work. In contrast, while multiple forms of personal reciprocity were tested, none were associated with increased donor behavior. Volunteer behavior, however, was associated with a wide range of reciprocity, from personal to community to ecological. Some of Caissie and Halpenny's (2003) motivations for volunteering for nature, namely perks, place, and legacy, were also salient for volunteers for NWP programs (Caissie & Halpenny, 2003). While some demographics were intermittently

associated with behavior, the patterns were inconsistent, indicating that a focus on motivations may be more effective in engaging donors and volunteers.

Donation behaviors

The association of donations with continued conservation efforts by NWPs, or ecological reciprocity, is a novel finding that has the potential to impact fundraising for NWPs and other conservation organizations. Our findings reaffirm previous research that organizational missions' relevancy to donors leads to continued support (Bendapudi et al., 1996). However, our results go further, showing that funding conservation efforts may be a core expectation of donors, potentially more influential than other motivations. We also found that familiarity with the NWP was associated with previous and future donation behavior, but only for existing donors. As familiarity with a state agency increases, the likelihood of providing financial support also increases (Grooms et al., 2022), so developing mechanisms to foster familiarity, like stronger outreach and relevant programming for existing supporters, may work to increase donor behavior.

Demographics are also often used to predict future donation behavior, and our findings support other research that shows that donor age and level of schooling are significant predictors of donations (Adloff, 2009). However, demographics are not predictive of future contributions. This may suggest that while dedicated groups of donors match traditional demographics, there may be a larger, more diverse group of supporters interested in donating who have not yet been appropriately engaged (Lobato et al., 2021). These groups may not be reached by focusing on specific demographics (e.g., older, more educated, and more affluent) or by repeated asks of supporters to solicit donations (Lobato et al., 2021). Traditional fundraising efforts have also concentrated on donor-focused forms of reciprocity (Belk, 1976; Bendapudi et al., 1996). For example, donors are frequently situated into "tiers" that receive items of increasing value (e.g., t-shirts or tote bags) or entries to win items or experiences based on donation amounts (Bentley, 2014). Yet, our research demonstrates that current and future donors may be influenced by their contributions funding conservation efforts. To engage a conservation-minded constituency, highlighting how contributions promote conservation work, especially as a function of contributions given, may be more effective at soliciting donations. For example, highlighting how donations support research or restoration efforts for charismatic species (Colléony et al., 2017) or providing information on existing donation matches (where private donors or state or federal funds "match" each donation) and their extent (Epperson & Reif, 2019; Sinkular et al., 2022).

Volunteer behaviors

Various motivations and forms of reciprocity were associated with volunteer behavior. Perks and natural place-based motivations were strongly associated with past and future volunteer behavior. Furthermore, personal place-based motivations emerged as the sole factor correlated with future volunteering among respondents with prior volunteer experience. These motivations underscore the public's interest in participating in wildlife conservation beyond organized volunteering events, extending it to their local communities and private lands. Prior studies have demonstrated that activating place-based motivations, whether personal or natural,

strongly predicts volunteer involvement (Amsden et al., 2013). While perks and natural place-based motivations didn't significantly influence future volunteering, it suggests that previous experiences may have fulfilled these motivations, and participants likely expect they will continue to be met. Research indicates that meeting expectations significantly influences future behavior (Caissie & Halpenny, 2003), emphasizing the importance of consistently meeting these and emerging motivations for sustained engagement. Simultaneously, respondents lacking previous volunteer experience were motivated by leaving a legacy, suggesting that volunteers expect projects to have enduring benefits. Providing opportunities to address these preferences will most likely lead to broader participation. Regularly monitoring volunteer feedback can be instrumental in understanding motivations and satisfaction levels with programs (Finkelstein, 2008), helping to facilitate long-term success.

Conservation organizations increasingly adopt community science programs to involve a broader range of volunteers in conservation efforts to ensure long-term sustainability. These programs effectively activate motivations, often by providing participants with sufficient information on the background, procedure, and optimistic outcomes through their engagement (Haywood & Besley, 2014). Most projects also occur on lands belonging to participants or public natural lands and set out to engage volunteers in conservation efforts. This creates opportunities to fulfill multiple motivations we found to be associated with volunteer behavior. Perks and legacy motivations can be met through thoughtful project design, specifically building in opportunities for volunteers to ask questions of agency staff and highlighting the long-term goals and outcomes of participation. Place-based motivations, both on personal and natural lands, are likely to be met by projects occurring on these lands, so emphasizing these aspects may draw more participants. Additionally, a core goal of community science programs is to increase community engagement and promote interest and familiarity with scientific institutions (Burgess et al., 2017; Pandya, 2012), which may also increase donations. Investing in and growing these programs with participant motivations in mind could be an essential tool for NWPs to remain relevant and engaging to a changing constituency.

Ultimately, our study offered crucial insights into the motivations influencing support for NWPs. Donors exhibited a strong inclination toward contributing to conservation efforts, challenging conventional fundraising approaches that rely on donor-focused incentives. Volunteer motivations span personal, community, and ecological reciprocity, with perks like having access to professionals influencing engagement. Additionally, the importance of perks, legacy, and place-based motivations supports the potential success of expanding and integrating community science programs into NWPs and conservation organizations on the whole. Overall, our findings underscore the importance of addressing diverse motivations, highlighting conservation impact for donors, broadening strategies for donor and volunteer asks, and aligning volunteer experiences with favored motivations to sustain long-term engagement and support for NWPs in the changing landscape of conservation.

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Chapter 3: Building Equitable Engagement: Strategies for Enhancing Diverse Participation in Community Science

Abstract

Community science offers an innovative approach to engaging diverse communities in scientific research, challenging traditional top-down approaches to science and fostering meaningful collaborations between scientists and volunteers. However, despite the growth of community science programs, participation remains largely homogenous, with underrepresentation of Black, Indigenous, and people of color (BIPOC) communities. This research explores the facilitators and constraints to BIPOC participation in community science, utilizing an asset-based framework, Community Cultural Wealth (CCW), to understand persistence in engagement. Through online focus groups with BIPOC-serving program practitioners and BIPOC participants, we identified key factors encouraging BIPOC participation, such as BIPOC-led programs, longevity of engagement efforts, and proactively addressing barriers. Despite interest, persistent barriers included the perception of outdoor spaces as White-dominated, financial constraints, and discrimination. We recommend adopting a participatory research approach, tailoring programs to meet community needs, and investing in long-term, sustainable engagement strategies to support BIPOC communities in community science. This research underscores the importance of centering community voices, intersectionality, and persistent efforts in fostering equity within community science institutions.

Introduction

Community science is increasingly recognized as a valuable tool for fostering community engagement, particularly among historically marginalized groups. It can be defined as the inclusion of the general public in scientific research under the direction of professional scientists and institutions (Eitzel et al., 2017). Within natural resources, it is broadly used to gather ecological data that is largely inaccessible due to the amount of time and/or personnel required to collect the data (Lee et al., 2020) and is an emerging tool for conservation practitioners to engage a wider constituency base (Roger & Klistorner, 2016). Historically, community science has been top-down, where scientists design projects, recruit and train volunteers, and direct data collection (Cooper et al., 2021). However, that dynamic is shifting to more co-created, participatory designs where volunteers and scientists interact and, in some cases, develop projects together (Paul et al., 2018; Phillips et al., 2021), often through community-based participatory research (CBPR). CBPR provides autonomy for target communities to participate in all aspects of the research process, increasing the overall benefits to communities and honoring their knowledge, thereby challenging the traditional power dynamics of top-down science (Balazs & Morello-Frosch, 2013).

In the last couple of decades, there has been a substantial increase in community science programs and participants due in part to the dramatic increase in app-based community science opportunities like eBird (McKinley et al., 2017). Despite this growth, the demographics of community scientists are homogenous: a majority of participants are White, highly educated, and affluent (Perkins, 2020; Rutter et al., 2021). Accordingly, most community science is conducted in White and affluent neighborhoods, and there is a deficit of community science data

in neighborhoods that are ethnoracially-diverse, economically disadvantaged, and/or lower-resourced (Perkins, 2020). This deficit creates a substantial disparity, where affluent White communities access the suite of community science benefits, like meeting and interacting with scientists (Evans et al., 2005), increasing knowledge and value of science (Blake et al., 2020; Pandya, 2012), building social networks (Domroese & Johnson, 2017), and developing meaningful relationships between communities and scientific institutions (Yacoubian, 2017). These benefits often lead to better environmental advocacy for communities that are already highly resourced and not at risk of environmental degradation (Domroese & Johnson, 2017; Perkins, 2020). Despite noted demographic differences, limited research to date has examined facilitators and constraints to community science participation by underrepresented groups, specifically Black, Indigenous, and people of color (BIPOC). More generally, most research in outdoor activities has described BIPOC participation from a deficit-based perspective, i.e., how social, economic, or other factors constrain participation (e.g., Floyd et al., 2016; K. J. Lee & Scott, 2016). While awareness and addressing of barriers are valuable, understanding what most encourages and facilitates participation may be as effective in supporting BIPOC communities (Bagheri Hamaneh, 2024; Yosso, 2005). Using asset-based frameworks, such as Yosso's (2005) Community Cultural Wealth (CCW), to understand what allows BIPOC communities to persist in community science can shift approaches to avoid reaffirming existing power dynamics and narratives (Senteio et al., 2021; Yosso, 2005). As community science grows as a viable tool for both conservation practitioners and participants, there is a novel opportunity to address disparities and inequalities (Pandya, 2012). To foster equity within community science institutions and provide further support to BIPOC communities, our research aims to understand the factors that enable BIPOC participants' persistence in community science and what most limits this participation.

Methods

State Agencies and the MN Department of Natural Resources

State fish and wildlife agencies (hereafter state agencies) have historically engaged a homogenous group of primarily White men (Davis et al., 2002; Jacobson et al., 2022), a trend that has persisted for decades (Hodgdon, 1980; Keefe & Young-Dubovsky, 1996; NCSES, 2023). However, many conservation practitioners are working to expand this reach through social science research and community science initiatives (AFWA & WMI, 2019; Balazs & Morello-Frosch, 2013). The Minnesota Department of Natural Resources Nongame Wildlife Program (MNDNR NWP) is one such organization working to equitably engage a broader constituency. The MNDNR NWP is responsible for more than 2000 nongame species in Minnesota, and the program relies on volunteer support to monitor and manage these species (MNDNR NWP, 2021). It reaches tens of thousands of Minnesota residents annually through outreach on social media and email lists, but less than 300 people engage in their community science projects (MNDNR NWP, personal communication, 2022). Those who support the program through donations and volunteer action are overwhelmingly White and affluent (Jennings et al., 2024), not reflecting the overall demographics of Minnesota (U.S. Census Bureau, 2022). As we aim to better understand community science trends among BIPOC

communities, the MNDNR NWP's focus on collaboration and meeting community needs above organizational needs is an innovative approach to better support BIPOC community scientists.

Community Cultural Wealth

Community Cultural Wealth (CCW) is an asset-based framework primarily used in educational research to describe the persistence of BIPOC students in higher education, an environment shown to be inhospitable to BIPOC communities (Heinecke & Beach, 2021; Yosso, 2005). CCW outlines six types of capital (aspirational, navigational, social, linguistic, familial, and resistant) that provide BIPOC students with skills to succeed. These capitals are outlined in Table 1 below in greater detail. Our research primarily considered navigational, social, familial, and resistant capital, as linguistic and aspirational capital are less applicable to community science initiatives. This framework underlined our approach to understanding what most encourages participation and is a novel application of CCW in community science and nature-based participatory research.

Capital	**Definition (Yosso, 2005)**
Aspirational	"Maintaining hopes and dreams, even in the face of barriers."
Navigational	The "skills of maneuvering through … institutions not created with Communities of Color in mind."
Social	"Networks of people and community resources…[providing] both instrumental and emotional support to navigate institutions."
Linguistic	"The intellectual and social skills attained through communication… in more than one language and/or style."
Familial	"Cultural knowledges that carry a sense of community history, memory, and cultural intuition."
Resistant	"Knowlegdes and skills fostered through oppositional behavior that challenges inequality."

Table 1. The six types of community cultural wealth as described by Yosso (2005). Bolded capitals (navigational, social, familial, resistant) will be the primary focus of this research.

Focus Group Design

We conducted two separate series of online focus groups following procedures outlined in Stewart & Shamdasani (2014). First, we hosted two focus groups with five community science and outdoor recreation program practitioners each (10 total). We included outdoor recreation programs, which can often serve as a pathway to engaging in community science programs, building interest and care for the natural environment (Rosa & Collado, 2019). Additionally, the separation of outdoor recreation programs and community science programming was not distinct. Practitioners and their organizations were known to the researchers and personally invited to participate in focus groups. Organizations ranged from majority-White with BIPOC-

specific programs to majority-BIPOC, BIPOC-serving organizations. All organizations were based in the seven-county metropolitan area surrounding Minneapolis and St. Paul, but programs occurred throughout the state. Program practitioners were invited to participate in groups regardless of race to better match the heterogeneous landscape of people working to increase BIPOC engagement in community science and outdoor recreation. We selected focus group participants from organizations with well-established programs recommended by BIPOC communities.

We conducted a second series of online focus groups with BIPOC Minnesotans who participated in programs with one or more of our practitioner organizations. We recruited participants through social media and email lists of our partner organizations, prioritizing those that are BIPOC-serving. This allowed us to reach community members interested in conservation efforts and utilize existing structures to facilitate recruitment. BIPOC communities are often over-asked to participate in academic research (Kelley, 1998; Said, 2023; Tuhiwai Smith, 1999), and we worked to develop collaborative approaches to the research to lessen the burden of engaging with academic structures that may be inhospitable (Spivak, 2004). While we did not wholly co-produce the research, we followed CBPR principles to avoid exclusively top-down research in design, administration, and dissemination (Balazs & Morello-Frosch, 2013). Instead, our research centered on engagement with BIPOC community members and building mutual understanding. We developed our second series of focus groups using insights and perspectives from our first and focused on understanding how programs can meet personal and community needs instead of organizational needs. We also discussed our outcomes with participants through in-person and virtual workshops, where we highlighted the concrete ways their feedback was driving organizational change and invited participants to design and lead programs with the NWP for compensation.

Focus Group Administration

In total, we conducted five semi-structured online focus groups lasting 90-120 minutes. Two participants could not attend regular focus groups and were interviewed separately. Each of these participants was noted as an influential leader in community science, so we felt their perspectives were crucial to this work. To avoid their responses dominating results, interviews were limited to 30 minutes and respondents were asked the same questions. Researchers also remained mindful of selected quotes so no one voice is overrepresented. We developed a general script with key questions but allocated time for conversation and follow-up questions as needed. Questions focused generally on interest and participation in community science, support structures for participation, and feedback on potential community science programs. Within practitioner groups, these questions were posed at an institutional level (i.e., in what ways has your organization led or participated in community science?), whereas program participant groups were at an individual level (i.e., in what ways have you participated in community science?). Despite this distinction, many practitioners discussed their personal experiences, and many participants described their experiences as outdoor program leaders. All participants consented to participate in the focus groups per Institutional Review Board (IRB) guidance (IRB# 21-850) and were compensated with a yearly Minnesota State Park pass.

The primary author conducted all focus groups with assistance from the secondary author. In addition, representatives from the MNDNR NWP gave a short presentation about their program and potential community science projects to elicit specific feedback. Within practitioner groups, MNDNR NWP staff were present throughout to answer specific questions and listen to responses but did not ask questions of participants. This method allowed the MNDNR NWP to begin building relationships with community organizations and hear relevant feedback directly (Cameron et al., 2023). During focus groups with program participants, staff were only present to describe the MNDNR NWP and answer any questions. Staff were absent for participant responses to allow candid responses and avoid discomfort due to existing power dynamics (Cameron et al., 2023).

Analysis

We used Zoom audio recording and built-in transcription to record and transcribe the focus groups. We then edited transcripts by hand for accuracy. We used the program Dedoose to code transcripts using deductive and inductive techniques. We developed a codebook for deductive coding using Yosso's CCW framework (Appendix 3A and 3B). We used inductive coding to determine if there were any emergent themes beyond our deductive codes. Codebooks were discussed prior to coding with the first and third authors and iteratively throughout the coding process. The lead author completed the coding, first by reading the transcripts and coding large sections while taking notes on emergent themes, then reading and coding more fully, and then conducting a final pass to ensure no deeper meanings were missed.

Results

We conducted five focus groups with 20 respondents, including ten program practitioners and ten program participants. Most respondents were from the seven-county Metropolitan area surrounding Minneapolis and Saint Paul, except for two from a secondary urban region of Minnesota. Respondents ranged in age from 21 to 61, but nearly two-thirds were between 21 and 35. There were four men, three nonbinary respondents, and 13 women.

All program participants identified as BIPOC, as did five practitioners. Additionally, four respondents shared that they identified as Lesbian, Gay, Bisexual, Transgender, and/or Queer (LGBTQ+). Including the three people who identified as nonbinary, there were at least seven LGBTQ+ respondents. As we did not ask about sexual orientation, it is possible that other respondents identified as such but did not share that with researchers.

Facilitators and constraints to participation in community science

Respondents indicated several themes that encouraged or limited their participation. Generally, they were interested in community science programs with and beyond the MNDNR NWP. However, they preferred programs catered to their communities and interests led by practitioners who share their cultural and ethnoracial backgrounds. Despite an asset-based approach, many respondents highlighted persistent barriers that limited their participation.

These barriers seemed to increase for those with intersecting minoritized identities, for example, women of color and queer and trans people of color (QTPOC).

Facilitators for participation

We found that respondents were generally interested in community science initiatives, especially BIPOC-led and BIPOC-specific programs that address community needs. Nearly all respondents said variations of “I’m definitely interested in getting involved,” and “It intrigues me a lot,” especially about programs that provide opportunities for them to learn more. One respondent discussed what drew them to previous programs.

> “I’m interested when there is an expert or someone who's really knowledgeable in a particular area. If they are part of the group or giving some kind of a presentation as part of the community science project, I think that’s really cool. I really enjoy that.”

Respondents also expressed interest in community science programs “with other BIPOC folks” that further conservation efforts and “meet community needs.” Multiple respondents said, “what really interests me is wildlife stuff” and that they “get excited any time [they] see an animal.” To expand, one respondent said,

> “I personally really like the community aspect of it…. I volunteered at a community event, and getting a lot of people together and enjoying a natural phenomenon is a very cool shared experience.”

Respondents consistently discussed connectivity to nature as encouraging participation. They highlighted connectivity between humans and nature, within ecosystems, and between non-indigenous and indigenous stewards. Multiple respondents described how they “always gravitate toward being outdoors” and that programs “allow you to be grounded and focus on what is around you.” Many mentioned preferring programs that “respect the land,” especially concerning traditional ecological knowledge, and a need to “emphasize the connection between us and nature, rather than nature being its own separate thing.”

Finally, respondents often discussed how programs that proactively addressed barriers, like “providing whatever equipment is needed,” were more effective in encouraging participation and that organizations that “identify and pull down barriers” were more appealing to community groups.

Constraints to Participation

While respondents described positive spaces they had built and participated in, they still discussed significant barriers. The primary barrier was the general sociocultural environment of the outdoors as White-only, BIPOC- and LGBTQ+-exclusive spaces. Participants shared explicit instances of racism, sexism, homophobia, and transphobia, as well as more duplicitous forms, like facing condescension or disbelief that participants had the necessary skills to participate in

programs. Many respondents indicated similar sentiments to, “I tend not to do a lot of outdoor stuff because of White people. The way they look at me or how I have to be an expert to be able to enjoy activities.” This appeared to be a more significant barrier for women of color and QTPOC. An LGBTQ+- identified respondent built upon this by saying:

> “It's very rare that I will go to a public program anymore, just because of all the racism and sexism and all the isms that can happen. There's like a five percent chance I would go. It's not worth it.”

Many respondents also expressed a need to overturn power dynamics in community science, often asking, “What does it mean to empower community members to become experts?” and “How can [institutions] sustain this work?” They discussed moving away from programs that embody White, top-down approaches and instead “reframe” and “restructure” to build equitable community science programs from the ground up. They also called for longevity in engagement efforts, stating that “deep investment in the form of funding and capacity” is needed so that programs supporting diverse participation are not subject to organizational or staff changes. A respondent expanded:

> “I want to challenge these agencies to do your own internal changes and transformation, because that will reflect how you are going to serve communities. If it is the same people who look the same and carry the same ideologies in leadership roles and have the power, you will just sustain that system. [It is] like trying to find band-aids to a problem that needs to just be completely imploded and then really restructured.”

Nearly all respondents who discussed barriers also mentioned a variation of “it’s too expensive” and “having equipment is a barrier.” In line with this, multiple respondents indicated that “transportation is a big issue” due to a reliance on public transportation, biking, and unreliable vehicles. Respondents expand below:

> “It depends on where it is. If it's in a state park or something, there's always a fee to enter or it’s something where you have to pay. Money isn't super expendable to me.”

And

> “My main mode of transportation is bike, and I find it pretty hard to get to a lot of things that aren't directly in The Cities [Twin Cities]. Even though I think the things are cool. I have to convince someone else who has a car to come.”

Community Cultural Wealth

Respondents highlighted multiple forms of capital that encouraged their continued participation: navigational, resistant, social, and familial. Numerous respondents discussed how they had knowledge and skills to succeed in programs (navigational capital), even if majority-White organizations or groups didn’t appreciate those skills. One respondent discussed this below.

> “The lived experiences that your participants have are equally as powerful. I've paddled thousands of miles of rivers. But I am not trained in Whitewater or have certifications to tell you that. But my lived experience equates to that, in a sense that I equally know as much as you do. And I know that.”

Many practitioners described using resistant capital in their path to become community leaders, mentioning how most people in community science “don’t look like us” and how they “built capacity” themselves within their organizations. One practitioner described their experience from casual birder to community leader:

> “I don't see people like me being leaders, so I got the idea that I was going to start a mentoring program. I knew that we needed to hold safe space for people to be out in nature. So I found eight of my friends who I knew loved birding and how to create a safe space. We led walks and everyone was like, ‘oh my God, this is amazing.’ …We’re doing everything right. We’re going to continue to hold our own system.”

To highlight how community science initiatives allowed them to build social and familial capital, respondents discussed sharing these experiences with others. When discussing potential programs, this respondent highlighted familial capital by saying:

> “It will be a good opportunity to bring family, [especially] younger family members, to expose them to these kinds of things in a community setting and as a fun group activity…. I would take my younger brother too and be like, ‘Hey, there's so many cool things in nature.’”

Another respondent built upon this by saying, “that's what we value. It’s when we're able to pass it on to our next generation.”

Many respondents also described how community members understand the need to "build community” and maintain connections (social capital), especially compared to traditional, majority-White organizations. A respondent expressed their experience with a BIPOC kayaking trip:

> “That was a really reaffirming experience…. I appreciate being able to find a community with people who are willing to help guide you.”

Another described how participating in longer-term projects allowed for, “having more focused time with people [to] build relationships together.”

Discussion

We set out to determine how the MNDNR NWP can better engage Black, Indigenous, and communities of color in community science. More specifically, we wanted to understand what allows communities of color to persist in community science programs while also

acknowledging what limits them. In agreement with emerging research (Anderson, 2021; Castillo, 2022), we found that respondents were interested in contributing to community science initiatives, especially those that occur within their communities, address community needs, and are led, at least in part, by BIPOC individuals. They were especially interested in programs that focus on wildlife and hire community members to administer them. However, many respondents still highlighted barriers that limit their participation and made recommendations to increase equity in community science.

Participants highlighted multiple aspects of CCW when discussing their community science engagement. Exemplifying resistant capital, respondents discussed how they developed safe programs and spaces for BIPOC and QTPOC participants, often by explicitly carving this out of majority-White spaces through a focus on collective action, i.e., coming together in groups to increase safety and resist negative interactions with White participants. In addition, participants discussed how friends and family members helped to foster participation and how they would like to further share these experiences with them, highlighting the importance of social and familial capital in supporting participation and affirming previous studies (Scott & Shafer, 2001). They also expressed how the skills they developed independent of majority-White opportunities allowed them to persist when confronted with racism or sexism in White-centric spaces. A combination of these approaches appears to facilitate persistence in community science and outdoor engagement despite combating structures that implicitly and explicitly state that the outdoors are not for them.

Despite not intentionally recruiting Queer and Trans people of color (QTPOC) participants, more than one-third of our respondents identified as such. This is a novel opportunity to discuss the intersectionality of QTPOC in the outdoors and community science specifically, as very few published studies explore QTPOC engagement in any outdoor activities. As social attitudes continue to shift favorably towards LGBTQ+ people, we are seeing increases in adults identifying as LGBTQ+, especially generationally (Jones, 2022). While less than 5% of Baby Boomers and Generation X identify as LGBTQ+, 10.5% of Millennials and 20.8% of Generation Z identify as something other than straight or cisgender (Jones, 2022). The intersection of LGBTQ+ and BIPOC identities likely puts participants at a higher risk of discrimination, intolerance, and even violence (Coston, 2019; Oakleaf & Richmond, 2017), a fact many of our respondents highlighted.

Recommendations

Our results highlight a few overarching recommendations for conservation practitioners aiming to engage more BIPOC participants. In designing community science programs, organizations must develop mechanisms to address traditional and emergent barriers to ensure that initial barriers do not limit participation. However, we recommend that conservation practitioners go beyond deficit-based considerations to recognize the unique experiences and perspectives brought by community members and find ways to elevate community members in programs and leadership. One way to achieve this is through co-produced projects with target communities, or CBPR. CBPR can disrupt deficit thinking by acknowledging and uplifting

community members' assets to programs (Suarez-Balcazar, 2020), and in combination with CCW, has promise as an effective tool outside of its traditional disciplines (O'Fallon & Dearry, 2002; Wallerstein et al., 2020). Within community science, a CBPR approach can honor community members' deeper understanding of the existing landscape, what issues are most pressing, and where community science can help to address these (Balazs & Morello-Frosch, 2013). However, it should be combined with other methods, like moving away from one-size-fits-all approaches and intentional partnership-building before project development to be most effective.

Projects should also consider the variable experiences that BIPOC communities may have with the outdoors and consider how to adjust programs to meet community needs. For example, legacies of enslavement and Jim Crow-era policies live in the collective memory of Black participants (Johnson & Bowker, 2004), but so, too, do legacies of resistance and the wilderness as a place of refuge, community-building, and spirituality (Theriault & Mowatt, 2020). Tribal communities were also forcibly removed and prohibited from accessing sacred sites that are now public recreation lands (Zeppel, 2009). These interplays impact individual and community relationships with the outdoors and are unique for different community groups. Providing opportunities that are specific to and cognizant of these interplays may be more effective in encouraging engagement. Additionally, organizational understanding and acknowledgment of these histories may help to develop stronger relationships between organizations and communities (Chen-Carrel, 2023).

Finally, programs should consider long-term, sustainable engagement. We are in a mainstreaming of diversity, equity, and inclusion (DEI) efforts, with establishments ranging from outdoor organizations to universities to corporations pledging their commitment to DEI work (e.g., Ferraro et al., 2023; Gordon Perue et al., 2021; Tarin et al., 2021). However, investment in this work is beginning to taper off as public pressures wane and economic downturns loom large (Ayas et al., 2023). Organizations should consider internal and external approaches to avoid divestment in DEI efforts. Our respondents highlighted a few internal approaches, such as developing stable funding and staff capacity and hiring permanent staff with shared backgrounds and cultural competency. These approaches will likely help to establish lasting ties between communities and community science organizations. Externally, organizations should consider long-term, meaningful engagement with target communities. Single or one-off interactions are much less effective for building continued investment (Martin et al., 2020), so organizations should consider increasing the frequency and types of opportunities to reach more people (Cleary et al., 2020). How exactly to achieve long-term engagement will vary with location, target community, and existing relationships. Engaging diverse communities should be part of overall organizational efforts to weave equity and inclusion work into institutional foundations, ensuring its sustained success. Our research underscores the importance of community-centered approaches, intersectionality, and sustained investment in diversity, equity, and inclusion efforts in supporting Black, Indigenous, and communities of color in community science.

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Conclusion

Over the last few decades, we have experienced drastic changes in both public demographics (U.S. Census Bureau, 2021) and engagement with state agencies (AFWA & WMI, 2019) tasked with protecting our most vulnerable species. This research aimed to understand the factors driving i) diverse participation in wildlife viewing and community science, ii) engagement with and support of state agencies, and iii) equitable approaches to engaging historically excluded groups. Ultimately, the purpose of this research was to lay a more concrete foundation for sustainable engagement and support of Black, Indigenous, and people of color in the United States, as well as provide a deeper understanding of current engagement with state agencies and recommendations for future directions.

Summary of findings

In Chapter 1, we examined differences between White and BIPOC wildlife viewers in their participation, support, identity, and importance. While participation in wildlife viewing has increased among BIPOC communities, significant gaps remain, with BIPOC individuals engaging less around their homes but often more away from home compared to White viewers. Social support is crucial in encouraging BIPOC participation, suggesting the importance of fostering community connections and mentorship opportunities. Additionally, BIPOC respondents express lower self-identification as wildlife viewers despite valuing wildlife viewing at similar or greater levels than White respondents, indicating the influence of historical exclusion and the need for increased representation and inclusion efforts in outdoor recreation spaces. Understanding and addressing these disparities is essential for fostering diverse and equitable engagement with nature, promoting individual well-being, and encouraging environmental stewardship in an increasingly diverse society.

In Chapter 2, we explored support (volunteering and donating) and engagement behavior with a state agency's Nongame Wildlife Program (NWP). NWPs are pivotal in protecting and monitoring rare and vulnerable wildlife species. Despite their importance, they often face budget constraints, relying on public donations and volunteers to complete their work. This study delves deeper than previous research to understand the varied motivations driving financial support and volunteerism for NWPs. Findings suggest that while donors prioritize supporting conservation efforts, volunteers are motivated by factors such as access to professionals, place-based interests, and the desire to leave a legacy. These insights emphasize the need for tailored engagement strategies that highlight conservation impact, broaden outreach efforts, and align volunteer experiences with diverse motivations to ensure the long-term success of NWPs amidst evolving conservation challenges.

In Chapter 3, we used qualitative methods to better understand support systems for BIPOC participants in community science. As state agencies attempt to engage a more diverse constituency, many are turning to community science as a way to build more equitable relationships. The Minnesota Department of Natural Resources NWP is one such agency that seeks to involve a broader demographic base while supporting community needs. Despite the

growth of community science initiatives, demographic disparities still exist, with BIPOC communities underrepresented. Our research, guided by Yosso's Community Cultural Wealth framework, aimed to understand and support BIPOC participation in community science (Yosso, 2005). Through focus groups, we found BIPOC individuals continue to participate in community science through navigational, resistant, and social/family capitals, allowing them to persist in the face of barriers related to institutional structures, lack of representation, and economic constraints. To better support BIPOC community scientists, we recommend co-producing community science projects with target communities, acknowledging and addressing diverse historical relationships with the outdoors, and ensuring long-term, sustainable engagement to foster lasting connections between organizations and communities.

Contributions to Research

This research makes several significant scholarly contributions. First, it introduces a novel application of Yosso's Community Cultural Wealth (2005) framework to the context of wildlife viewing and participation in nature-based community science projects (Yosso, 2005). By extending the framework into conservation and outdoor recreation domains, this study validates its premise that BIPOC communities utilize diverse forms of capital to navigate environments that may be unwelcoming. Secondly, it novelly applies Caissie and Halpenny's (2003) theory of volunteering for nature (Caissie & Halpenny, 2003), along with combining Kimmerer's (2011) and Belk's (1976) theories of reciprocity (Belk, 1976; Kimmerer, 2011), to investigate support for conservation organizations. Through this approach, the research sheds light on the motivations behind donating to or volunteering with such organizations, offering insights into supporter decision-making processes.

Moreover, this study contributes to the limited body of literature on BIPOC involvement in wildlife viewing and community science, as well as the factors influencing engagement with state agencies, particularly state Nongame Wildlife Programs (NWPs). The research lays the groundwork for further exploration and development within these scientific domains by filling these gaps.

Contributions to Conservation and Equity

This thesis offers valuable insights and practical contributions to the field of conservation. Specifically, our findings underscore the significant motivations driving supporters to engage with state agencies, particularly how their contributions benefit conservation and biodiversity. These insights illuminate effective framing strategies for conservation organizations seeking to garner increased funding and volunteer support to advance their missions.

Moreover, to diversify engagement in wildlife viewing and community science, our research identifies a range of strategies to enhance the involvement of BIPOC individuals and queer and trans people of color. Organizations dedicated to conservation and outdoor recreation can utilize these findings to better support BIPOC participants, challenging traditional deficit-based perspectives and embracing asset-based approaches to participation in conservation and wildlife viewing.

Limitations

Despite the significant contributions made by this work, it is important to acknowledge several limitations. In Chapter 1, our exploration of Yosso's CCW framework (Yosso, 2005) was constrained by the scope of our study, which was a small section of a larger survey on wildlife viewing. Consequently, we could only examine social support, limiting our ability to speak to other dimensions of CCW. Furthermore, due to the small sample sizes of certain ethnoracial groups, we could not thoroughly examine intersectionality, which is crucial for understanding participation in outdoor recreation.

In Chapter 2, a modified snowball sampling technique was necessary due to the unpredictable nature of recruiting for survey participation via social media. Because Facebook posts can be shared widely, refining the sample, i.e., determining which responses were in-scope vs. out-of-scope, required considerable effort. Because we had to determine who was and was not included, we likely excluded some respondents who are highly likely to support the MNDNR NWP in the future while including some who are not. Additionally, our use of relatively simple statistical analyses like binary logistic regressions to identify motivational patterns may have limited the robustness and consistency of our results, which may be improved by more advanced statistical methods, such as Bayesian approaches.

Lastly, in Chapter 3, despite multiple requests and partnerships with community groups, we were unable to recruit more than 20 participants, likely due, in part, to community fatigue in participating in scientific research. This small sample size limited our ability to achieve data saturation. Despite identifying recurring themes, important insights were likely overlooked due to the sample size of only 10 participants in each group. Moreover, the lack of in-depth demographic information, such as household income and sexual identities, may have limited our understanding of emergent themes, especially as they relate to the intersection of multiple marginalized identities.

Future research

Our work lays foundations to further examine diverse participation in outdoor recreation and community science while also re-establishing a baseline understanding of engagement with state agencies. Future work with wildlife viewers should prioritize surveying BIPOC respondents, specifically to better examine interplays between gender, economic resources, and participation. Additionally, a more comprehensive examination of participation through Yosso’s CCW framework could offer deeper insights into the influence of various forms of capital on behavior. For future research involving supporters of state agencies, there is a need to move beyond traditional demographic analyses and delve into the underlying motivations and preferences that drive engagement. Moreover, while our study focused on individuals associated with the MNDNR, exploring the engagement and preferences of the general public could provide valuable comparative insights. Lastly, future investigations into BIPOC involvement in community science would benefit from the development of quantitative

frameworks. While focus groups offer contextual richness, quantitative research is essential for understanding participation and motivations on a broader scale.

Closing

As we grapple with pressing global issues ranging from equitable access to nature and conservation to alarming declines in wildlife populations, it is increasingly vital to understand the factors that facilitate success. This thesis has begun to describe these factors through focus groups and surveys across diverse demographics. By leveraging the insights of this work, agencies can continue to build more equitable systems to face continued conservation and social challenges.

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Appendix

Appendix 1A: Wildlife Viewing Questionnaire

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Thank you for your interest in taking this survey! Before we get started, we would like to share some information about this research study with you.

ABOUT THIS STUDY

This survey is being conducted by researchers at Virginia Tech, with funding from the Association of Fish and Wildlife Agencies (AFWA) and individual fish and wildlife agencies across the United States. **The goal of this research is to learn about the activities, experiences, and preferences of people who recreationally participate in wildlife viewing**, which includes observing, photographing, or feeding wildlife; improving or maintaining wildlife habitat; or visiting parks and natural areas for the primary purpose of wildlife viewing.

This survey should take you about 15-25 minutes to complete. Your participation in this research study is **voluntary and anonymous**. Your responses will never be presented in a way that they can be connected to your identity. The results of the survey will be published in summary form in reports, graduate theses, and journal articles. Anonymous survey data will be made available to state fish and wildlife agencies and may be archived online in a publicly accessible format. There are **no known risks** associated with this research; there are **no right or wrong answers** to survey questions; and **you can leave the survey at any time**, for any reason.

First, we would like to know about your participation in different kinds of wildlife viewing.

In which, if any, of the following forms of **wildlife viewing** have you participated in the past 5 years?

Note: *For this survey,* ***"wildlife"*** *refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural environments, including in urban and semi-urban places. Wildlife does not include animals living in artificial or captive environments, such as aquariums, zoos, or museums, or domestic animals such as farm animals or pets.* ***"Wildlife viewing"*** *refers to intentionally observing, photographing, or feeding wildlife; improving or maintaining wildlife habitat; or visiting parks and natural areas for the primary purpose of wildlife viewing. Wildlife viewing does not include simply noticing wildlife while doing something else, such as gardening, exercising, hunting, or fishing, or intentionally scouting for game.*

(Please select all that apply.)

- ☐ Closely observing wildlife or trying to identify unfamiliar types of wildlife
- ☐ Photographing or taking pictures of wildlife
- ☐ Feeding wild birds
- ☐ Feeding other wildlife
- ☐ Maintaining plantings or natural areas for the benefit of wildlife
- ☐ Visiting parks and natural areas to observe, photograph, or feed wildlife
- ☐ Taking trips or outings to any other location to observe, photograph, or feed wildlife
- ☐ I did not participate in any of these forms of wildlife viewing in the past 5 years.

Before we continue with the rest of the survey, we have just a few quick questions about you.

In **what year** were you born?

(Please select your birth year from the drop-down list.)

Which state do you live in for most of the year?

(Please select a state from the drop-down list.)

What is your **gender**?

(Please select one.)

- ◯ Man
- ◯ Woman
- ◯ Non-binary
- ◯ Prefer to not disclose
- ◯ Prefer to self-describe

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What is the **highest degree or level of school** you have completed?

(Please select one.)

- ○ High school diploma, equivalent, or less
- ○ Some college
- ○ Associate's or technical degree
- ○ Bachelor's degree
- ○ Professional, master's or doctoral degree

Now, we would like to ask you more about your wildlife viewing activities.

Which of the following **types of wildlife** are you interested in observing, photographing, or feeding?

(Please select all that apply.)

- ☐ **Insects or spiders**
  (such as butterflies, dragonflies, beetles, etc.)
- ☐ **Amphibians**
  (such as frogs, salamanders, etc.)
- ☐ **Reptiles**
  (such as turtles, snakes, etc.)
- ☐ **Birds**
  (such as songbirds, waterfowl, birds of prey, etc.)

- [ ] **Land mammals**
(such as deer, bears, elk, etc.)
- [ ] **Marine mammals**
(such as whales, seals, dolphins, etc.)
- [ ] **Freshwater or saltwater fish**
(such as sunfishes, darters, trout, salmon, sea bass, etc.)
- [ ] **None of the above,** *I am interested in observing, photographing, or feeding other types of wildlife*
- [ ] ***None of the above**, I am not interested in observing, photographing, or feeding wildlife*

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How would you **rate your skill level** in wildlife viewing?

(Please select one.)

- ○ Beginner
- ○ Novice
- ○ Intermediate
- ○ Advanced
- ○ Expert

Next, we would like to know about your expenditures related to wildlife viewing.

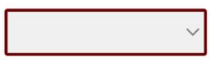
How much money do you spend on the following expenses related to wildlife viewing in a typical year?

Note: *Throughout this survey we will ask you about your activities during "a typical year." This is because we recognize that the last year has been unusual due to the COVID-19 pandemic, and this may have impacted your participation in wildlife viewing. By "a typical year," we mean a recent year (within the last ~5 years) that was not impacted by unusual circumstances like the COVID-19 pandemic. If you started viewing wildlife during the pandemic, please answer all questions about "a typical year" for the past year.*

(For each expense category below, please select the response that contains your best estimate of how much you typically spend.)

Trip-related costs for wildlife viewing *(such as transportation, lodging, guide fees, or access fees)*

All other wildlife viewing expenses and equipment *(such as binoculars, hiking or boating equipment for viewing, field guides, bird feeders or bird food, or membership dues for wildlife viewing organizations)*



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Now, we would like to know more about the role of wildlife viewing in your life.

To what extent do you **agree or disagree** with the following statements?

(Please select one response per statement.)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I think of **myself** as a wildlife viewer.	○	○	○	○	○
Being a wildlife viewer is an important part of **who I am**.	○	○	○	○	○
Wildlife viewing has a **central role** in my life.	○	○	○	○	○
A lot of my life is **organized** around wildlife viewing.	○	○	○	○	○
Wildlife viewing is **not an important** part of my life.	○	○	○	○	○
People who **look like me** participate in wildlife viewing.	○	○	○	○	○
I feel **welcome** among other wildlife viewers.	○	○	○	○	○
Being a wildlife viewer is **not a key** part of who I am.	○	○	○	○	○
I **teach** or **mentor** others in wildlife viewing.	○	○	○	○	○

We are also interested in your history with wildlife viewing.

How did the **COVID-19 pandemic** impact your overall participation in wildlife viewing?

(Please select one.)

- ○ **No impact;** I was wildlife viewing prior to the COVID-19 pandemic, and I continued wildlife viewing during the pandemic.
- ○ I was wildlife viewing prior to the COVID-19 pandemic, but **I stopped wildlife viewing** during the pandemic.
- ○ While I previously participated in wildlife viewing, I was not currently wildlife viewing when the COVID-19 pandemic started. During the pandemic, I **started wildlife viewing again**.
- ○ I **started wildlife viewing for the first time** during the COVID-19 pandemic.

For about **how many years** have you participated in wildlife viewing?

(Please select the category that contains your best estimate.)

In this section of the survey, we will ask you about how much time you spend wildlife viewing in different locations. The first question asks about the number of days you spend wildlife viewing in *a typical year*. The next two questions ask you about how many days you spent wildlife viewing in the *past year* and how much time you think you will spend wildlife viewing in the *upcoming year*.

First, **how many days** do you spend wildlife viewing in each of the following locations **in a typical year**?

Note: By "a typical year," we mean a recent year (within the last ~5 years) that was not impacted by unusual circumstances like the COVID-19 pandemic.

(Please select the response that contains your best estimate for the number of days you spend wildlife viewing in each location. If you do not typically participate in wildlife viewing in these locations, please select 0 days.)

	0 days	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	181-210 days	211 or more days
Around or within 1 mile of your home	○	○	○	○	○	○	○	○	○
More than 1 mile away from your home, but within your state	○	○	○	○	○	○	○	○	○
Outside of your state or outside of the United States	○	○	○	○	○	○	○	○	○

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In this section of the survey, we will ask you about how much time you spend wildlife viewing in different locations. The first question asks about the number of days you spent wildlife viewing in *the first year of the COVID-19 pandemic*. The next question asks how much time you think you will spend wildlife viewing in *the upcoming year*.

How many days did you spend wildlife viewing in each of the following locations **during the first year of the COVID-19 pandemic** (March 2020 - February 2021)?

(Please select the response that contains your best estimate for the number of days you spent viewing in each location. If you did not participate in wildlife viewing in these locations in the first year of the COVID-19 pandemic, please select 0 days.)

	0 days	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	181-210 days	211 or more days
Around or within 1 mile of your home	○	○	○	○	○	○	○	○	○
More than 1 mile away from your home, but within your state	○	○	○	○	○	○	○	○	○
Outside of your state or outside of the United States	○	○	○	○	○	○	○	○	○

How many days do you think you will spend wildlife viewing in each of the following locations **in the next 12 months**?

(Please select the response that contains your best estimate for the number of days you expect to spend wildlife viewing in each location. If you do not expect to participate in wildlife viewing in these locations in the upcoming year, please select 0 days.)

	0 days	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	181-210 days	211 or more days
Around or within 1 mile of your home	○	○	○	○	○	○	○	○	○
More than 1 mile away from your home, but within your state	○	○	○	○	○	○	○	○	○
Outside of your state or outside of the United States	○	○	○	○	○	○	○	○	○

Now, we would like to know more about where you participate in wildlife viewing in ${q://QID244/ChoiceGroup/SelectedChoices}.

In a typical year, in **which locations** do you participate in wildlife viewing in ${q://QID244/ChoiceGroup/SelectedChoices}?

Note: *By "a typical year," we mean a recent year (within the last ~5 years) that was not impacted by unusual circumstances like the COVID-19 pandemic.*

(Please select all that apply.)

- ☐ My own home or property
- ☐ Property of friends or family
- ☐ Other privately-owned areas *(such as lands owned by land trusts, non-profit organizations, private companies, or individuals)*

- [ ] Locally-managed areas *(such as town or county parks, trails, or open spaces)*
- [ ] State-managed areas *(such as state parks, forests, boat landings, fishing areas, conservation areas, or Wildlife Management Areas)*
- [ ] Federally-managed areas *(such as National Parks, National Wildlife Refuges, Bureau of Land Management Land, Waterfowl Production Areas, or National Forests)*
- [ ] Tribal lands
- [ ] I am unsure who owns or manages the areas where I participate in wildlife viewing.
- [ ] I do not participate in wildlife viewing in any of the above locations.

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Next, we would like to understand the factors that support and limit your participation in wildlife viewing.

To what extent do people in each of the following groups **encourage your participation** in wildlife viewing?

(Please select one response per statement.)

	Not at all	Very little	Somewhat	Quite a bit	A great deal
Family member(s)	○	○	○	○	○
Friend(s)	○	○	○	○	○
Mentor(s)	○	○	○	○	○
Peer(s)	○	○	○	○	○

To what extent do you experience **accessibility challenges** related to wildlife viewing?

Note: *By* ***"Accessibility challenges"*** *we mean the difficulties someone experiences in interacting with or while using the physical or social environment while trying to engage in a meaningful activity (such as wildlife viewing). This may be a result of a mobility challenge, blindness or low vision, intellectual or developmental disabilities (including Autism), mental illness, being Deaf or Hard of Hearing, or other health concerns. (Definition from Birdability.org)*

(Please select one.)

- ◯ Not at all
- ◯ Very little
- ◯ Somewhat
- ◯ Quite a bit
- ◯ A great deal

To what extent do each of the following **limit the extent of your participation** in wildlife viewing in a typical year?

***Note:** By **"a typical year,"** we mean a recent year (within the last ~5 years) that was not impacted by unusual circumstances like the COVID-19 pandemic.*

(Please select one response per statement.)

	Not at all	Very little	Somewhat	Quite a bit	A great deal
Lack of **free time** to participate in wildlife viewing	○	○	○	○	○
Few **people who support** your wildlife viewing activities	○	○	○	○	○
Few **people to participate in wildlife viewing with**	○	○	○	○	○
Lack of **organized viewing opportunities** within your community or social groups	○	○	○	○	○

Lack of wildlife viewing **skills**	○	○	○	○	○
Lack of access to **equipment or supplies** for wildlife viewing	○	○	○	○	○
Financial costs associated with wildlife viewing	○	○	○	○	○
Distance to high-quality locations for wildlife viewing	○	○	○	○	○
Not knowing **where to go wildlife viewing**	○	○	○	○	○
Lack of **transportation** to wildlife viewing locations	○	○	○	○	○
Accessibility challenges for yourself or the people you go wildlife viewing with	○	○	○	○	○
Lack of **facilities** at wildlife viewing locations	○	○	○	○	○
Safety concerns when wildlife viewing	○	○	○	○	○
Crowds in wildlife viewing locations	○	○	○	○	○

We are also interested in your participation in other kinds of outdoor recreation.

Which of the following **outdoor activities**, if any, do you participate in during a typical year?

Note: *By "a typical year," we mean a recent year (within the last ~5 years) that was not impacted by unusual circumstances like the COVID-19 pandemic.*

(Please select all that apply.)

- ☐ Road or mountain biking
- ☐ Camping
- ☐ Rock climbing or bouldering
- ☐ Fishing

- ☐ Foraging
  (for wild foods such as mushrooms or berries)
- ☐ Geocaching
- ☐ Hiking or backpacking
- ☐ Horseback riding
- ☐ Hunting
- ☐ Botanizing or viewing wildflowers, other plants, or fungi
- ☐ Recreational shooting sports or archery
- ☐ Swimming

- [ ] Motorized boating
- [ ] Non-motorized boating *(such as kayaking or canoeing)*
- [ ] Off-roading or use of Off Highway Vehicles *(such as ATVs or snowmobiles)*
- [ ] Running, jogging, or walking
- [ ] Winter sports *(such as skiing, snowboarding, or snowshoeing)*
- [ ] I do not participate in any of these activities.

Now we would like to know more about your interest in participating in wildlife or habitat conservation activities in the future.

How likely would you be to participate in each of the following **conservation activities** in the next 5 years, if you had the opportunity to do so?

(Please select one response per conservation activity.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Informing or **teaching** others about wildlife conservation	○	○	○	○	○
Enhancing wildlife habitat *(the place or environment where wildlife live and grow)*	○	○	○	○	○

Participating in **civic engagement** *(such as voting or advocating)* related to wildlife conservation	○	○	○	○	○
Collecting data on wildlife or habitat to contribute to science or management	○	○	○	○	○
Donating money to support wildlife conservation	○	○	○	○	○
Purchasing products that benefit wildlife or whose proceeds support conservation	○	○	○	○	○
Cleaning up trash or litter	○	○	○	○	○

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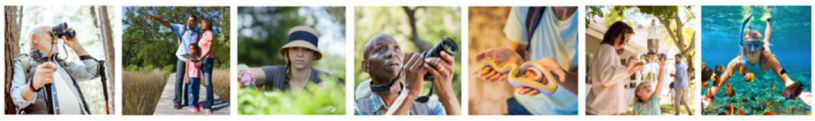

In this section of the survey, we would like to know more about your experiences with and thoughts about ${e://Field/StateAgency}, the state agency responsible for conserving fish and wildlife and their habitats and managing wildlife-related recreation in ${q://QID244/ChoiceGroup/SelectedChoices}, among other things.

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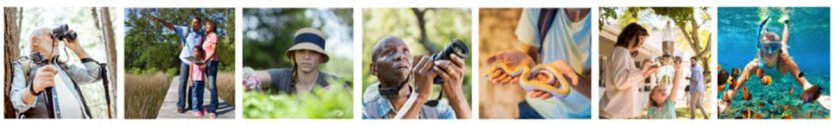

How **familiar** are you with ${e://Field/StateAgency}?

(Please select one.)

- ○ Not at all familiar
- ○ Slightly familiar
- ○ Moderately familiar
- ○ Very familiar
- ○ Extremely familiar

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Regardless of your level of familiarity with ${e://Field/StateAgency}, we are interested in your thoughts about **how the agency currently prioritizes** programs and services that support wildlife viewing. Please complete the following statement:

The level at which ${e://Field/StateAgency} prioritizes programs and services that support wildlife viewing is...

(Please select one.)

- ◯ Far too low
- ◯ Too low
- ◯ About right
- ◯ Too high
- ◯ Far too high
- ◯ I don't have an opinion.

We are also interested in any experiences you may have with the programs and services offered by ${e://Field/StateAgency}.

${e://Field/StateAgency} offers a variety of **programs and services** that connect people with wildlife and support wildlife viewing. Which of the following ${e://Field/StateAgency} programs and services, if any, have you **participated in or used** in the past 5 years?

(Please select all that apply.)

- [ ] Volunteer research or wildlife data collection opportunities
- [ ] Volunteer opportunities, not related to research or data collection
- [ ] Technical assistance or information about improving wildlife habitat
- [ ] Information about wildlife viewing opportunities in the state
- [ ] Information about wildlife in the state
- [ ] Programs or presentations for groups or clubs
- [ ] ${e://Field/StateAgency} lands
- [ ] ${e://Field/StateAgency} nature, education, or visitor centers
- [ ] Wildlife festivals or viewing competitions sponsored by ${e://Field/StateAgency}
- [ ] Live stream wildlife cameras
- [ ] Conservation law enforcement
- [ ] I have not used or engaged in any of these agency programs or services in the last 5 years.

Have any members of your household engaged in programming for children or youth provided by ${e://Field/StateAgency} *(such as school-based programs, camps, or youth and family events)*?

(Please select one.)

- ◯ **Yes**; children or youth in my household have engaged in some of these programs.
- ◯ **No**; children or youth in my household have not engaged in any of these programs.
- ◯ **Not applicable**; I do not have children or youth in my household.

Which, if any, of the following **agency programs and services** that you participated in or used were you **satisfied with?**

(Please select all agency programs and services that you were satisfied with. If you were dissatisfied with the program, please do not select it.)

- ☐ Volunteer research or wildlife data collection opportunities
- ☐ Volunteer opportunities, not related to research or data collection
- ☐ Technical assistance or information about improving wildlife habitat
- ☐ Information about wildlife viewing opportunities in the state
- ☐ Information about wildlife in the state
- ☐ Programs or presentations for groups or clubs

- [ ] ${e://Field/StateAgency} lands
- [ ] ${e://Field/StateAgency} nature, education, or visitor centers
- [ ] Wildlife festivals or viewing competitions sponsored by ${e://Field/StateAgency}
- [ ] Live stream wildlife cameras
- [ ] Conservation law enforcement
- [ ] Programming for children or youth
- [ ] I was not satisfied with any of the agency programs or services that I have experienced.

We would also like to understand how ${e://Field/StateAgency} can best meet the needs of wildlife viewers.

Which of the following potential programs or services from ${e://Field/StateAgency} would better **support your wildlife viewing activities**
in ${q://QID244/ChoiceGroup/SelectedChoices}?
(Please select all that apply.)

${e://Field/StateAgency} can better support my wildlife viewing activities by providing...

- [ ] Access to more **places** to go wildlife viewing
- [ ] More information about **where** to go to see wildlife
- [ ] More information about where and when to view wildlife where there is **no hunting**
- [ ] More information about **wildlife in ${q://QID244/ChoiceGroup/SelectedChoices}**
- [ ] More information about **how** to view various types of wildlife
- [ ] More programs to **interact** with other wildlife viewers
- [ ] More programs to improve wildlife viewing **skills**
- [ ] More **virtual programs** for wildlife viewing *(such as video classes, online presentations, or wildlife cameras)*

- [ ] More opportunities to be involved in volunteer **research** or wildlife data collection activities
- [ ] More opportunities to be involved in other **volunteer** activities, not related to research or data collection
- [ ] More opportunities for **youth** to learn how to participate in wildlife viewing
- [ ] More **training** opportunities for wildlife viewing guides or mentors
- [ ] More wildlife viewing **events** *(such as wildlife viewing festivals or competitions)*
- [ ] More agency **staff** to support wildlife viewing
- [ ] More **amenities** for wildlife viewing *(such as viewing platforms, blinds, or signs)*
- [ ] More **accessible features** in wildlife viewing locations *(such as paved trails, accessible parking, or tactile signage)*
- [ ] I am **not interested** in any of these options to support my wildlife viewing activities.

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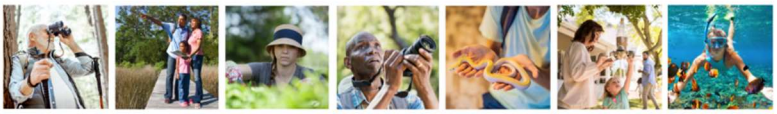

Now, we would like to know about your past financial support of ${e://Field/StateAgency}.

Below are a variety of ways that wildlife conservation and recreation opportunities provided by ${e://Field/StateAgency} are *financially* supported by the public in ${q://QID244/ChoiceGroup/SelectedChoices}. Which of the following **purchases or contributions**, if any, have you made in the past 5 years?

Note: *Please also select options for which you have ever made a one-time, permanent purchase, such as a lifetime hunting or fishing license.*

(Please select all that apply.)

- [ ] Any ${q://QID244/ChoiceGroup/SelectedChoices} hunting license
- [ ] Any ${q://QID244/ChoiceGroup/SelectedChoices} fishing license
- [ ] ${q://QID244/ChoiceGroup/SelectedChoices} conservation or habitat stamp *required with purchase of a hunting license*
- [ ] ${q://QID244/ChoiceGroup/SelectedChoices} conservation or habitat stamp *voluntarily purchased independent of a hunting license*
- [ ] Conservation or wildlife license plate
- [ ] ${e://Field/StateAgency} lands access pass, permit, or entrance fee
- [ ] Fees for a program or event hosted by ${e://Field/StateAgency}

- [ ] Voluntary donation of a portion of state income tax return to ${e://Field/StateAgency}
- [ ] Donation of land to ${e://Field/StateAgency} through a conservation easement
- [ ] Direct donation of money to ${e://Field/StateAgency}
- [ ] Lottery ticket for which the proceeds go to habitat conservation
- [ ] Virtual products from ${e://Field/StateAgency} *(such as podcasts, e-books, and other online materials)*
- [ ] Tangible products from ${e://Field/StateAgency} *(such as books, maps, and other merchandise)*
- [ ] I have not made any of these purchases or contributions.

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Do you hold a **lifetime fishing or hunting license**?

(Please select one.)

- ○ **Yes**, I have a lifetime fishing or hunting license.
- ○ **No**, I do not have a lifetime fishing or hunting license.

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Now, we would like to know about future purchases or contributions you may make to ${e://Field/StateAgency}.

How likely are you to make the following **purchases or contributions** in the next 5 years, assuming these options are available in ${q://QID244/ChoiceGroup/SelectedChoices}?
(Please select one response for each type of contribution, regardless of whether or not the option is currently available in ${q://QID244/ChoiceGroup/SelectedChoices}.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Any ${q://QID244/ChoiceGroup/SelectedChoices} hunting license	○	○	○	○	○
Any ${q://QID244/ChoiceGroup/SelectedChoices} fishing license	○	○	○	○	○
${q://QID244/ChoiceGroup/SelectedChoices} conservation or habitat stamp *required with purchase of a hunting license*	○	○	○	○	○
${q://QID244/ChoiceGroup/SelectedChoices} conservation or habitat stamp *voluntarily purchased independent of a hunting license*	○	○	○	○	○
Conservation or wildlife license plate	○	○	○	○	○
${e://Field/StateAgency} lands access pass, permit, or entrance fee	○	○	○	○	○
Fees for a program or event hosted by ${e://Field/StateAgency}	○	○	○	○	○
Voluntary donation of a portion of state income tax return to ${e://Field/StateAgency}	○	○	○	○	○
Donation of land to ${e://Field/StateAgency} through a conservation easement	○	○	○	○	○
Direct donation to ${e://Field/StateAgency}	○	○	○	○	○

Lottery ticket for which the proceeds go to habitat conservation	○	○	○	○	○
Virtual products from ${e://Field/StateAgency} *(such as podcasts, e-books, and other online materials)*	○	○	○	○	○
Physical products from ${e://Field/StateAgency} *(such as books, maps, and other merchandise)*	○	○	○	○	○

How likely would you be to provide **more financial support** than you currently do to ${e://Field/StateAgency}, if your contributions were used in the following ways?

(Please select one response per statement.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Supported **habitat** conservation	○	○	○	○	○
Supported conservation of **rare** or **vulnerable** species	○	○	○	○	○
Supported conservation of the types of **wildlife** you like to view	○	○	○	○	○
Supported more **opportunities** or **resources** for wildlife viewing	○	○	○	○	○
Supported wildlife **research** or **monitoring**	○	○	○	○	○
Were **matched** with funding from a different source	○	○	○	○	○

How likely would you be to participate in each of the following **conservation activities *with or in support of ${e://Field/StateAgency}*** in the next 5 years, if you had the opportunity to do so?

(Please select one response per conservation activity.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Informing or teaching others about wildlife conservation	○	○	○	○	○
Enhancing wildlife habitat *(the place or environment where wildlife live and grow)*	○	○	○	○	○
Participating in **civic engagement** *(such as voting or advocating)* related to wildlife conservation	○	○	○	○	○
Informing or teaching others about wildlife conservation	○	○	○	○	○
Enhancing wildlife habitat *(the place or environment where wildlife live and grow)*	○	○	○	○	○
Participating in **civic engagement** *(such as voting or advocating)* related to wildlife conservation	○	○	○	○	○
Collecting data on wildlife or habitat to contribute to science or management	○	○	○	○	○
Donating money to support wildlife conservation	○	○	○	○	○
Purchasing products that benefit wildlife or whose proceeds support conservation	○	○	○	○	○
Cleaning up trash or litter	○	○	○	○	○

To what extent do you agree or disagree with each of the **following statements about**

${e://Field/StateAgency}?

(Please select one response per statement.)

	Strongly Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Strongly Agree
I **trust** ${e://Field/StateAgency}.	○	○	○	○	○
I **trust** the **staff** at ${e://Field/StateAgency}.	○	○	○	○	○
I **doubt** the **honesty** of ${e://Field/StateAgency}.	○	○	○	○	○
Promises made by ${e://Field/StateAgency} are likely to be **reliable**.	○	○	○	○	○
I expect that ${e://Field/StateAgency} will **keep promises** they make.	○	○	○	○	○
I **do not doubt** the honesty of ${e://Field/StateAgency}.	○	○	○	○	○
I expect that ${e://Field/StateAgency} is **well-meaning**.	○	○	○	○	○
I expect that ${e://Field/StateAgency} has **good intentions** toward wildlife viewers.	○	○	○	○	○
I expect that ${e://Field/StateAgency}'s intentions are **benevolent**.	○	○	○	○	○
I **doubt** that ${e://Field/StateAgency} is **well-meaning**.	○	○	○	○	○

${e://Field/StateAgency} **knows about** wildlife viewing.	○	○	○	○	○
${e://Field/StateAgency} **understands** the environment they work in.	○	○	○	○	○
${e://Field/StateAgency} knows how to **support** to wildlife viewers.	○	○	○	○	○
${e://Field/StateAgency} **does not know** about wildlife viewing.	○	○	○	○	○

Which, if any, of the following ways are you interested in **receiving information** from ${e://Field/StateAgency}?

Note: *Your responses are for data collection only. ${e://Field/StateAgency} will not receive your specific response nor contact you as a result of this survey.*

(Please select all that apply.)

- ☐ Printed materials *(such as brochures and maps)*
- ☐ Mailed newsletter or other subscription
- ☐ Email update or e-newsletter
- ☐ Online magazine
- ☐ ${e://Field/StateAgency} website
- ☐ Local news *(such as television or online or print newspapers)*
- ☐ Blogs
- ☐ Facebook
- ☐ Twitter
- ☐ Tik-Tok
- ☐ Instagram
- ☐ YouTube
- ☐ Podcast

- [ ] Text alert
- [ ] One-on-one interaction with agency staff
- [ ] I would prefer not to receive information from ${e://Field/StateAgency}.

For about how many years total have you lived in

${q://QID244/ChoiceGroup/SelectedChoices}?

(Please select the number that's your best estimate of total years you've lived in ${q://QID244/ChoiceGroup/SelectedChoices}.)

What is your race and/or ethnicity?

(Please select all that apply.)

- [ ] American Indian or Alaska Native
- [ ] Asian
- [ ] Black or African American
- [ ] Hispanic, Latino, or Spanish
- [ ] Middle Eastern or North African
- [ ] Native Hawaiian or other Pacific Islander
- [ ] Some other race or ethnicity
- [ ] White

What was your total household income during the past 12 months?

(Please select one.)

- ◯ Less than $24,999
- ◯ $25,000 - $49,999
- ◯ $50,000 – $74,999
- ◯ $75,000 – $99,999
- ◯ $100,000 – $124,999
- ◯ $125,000 or more
- ◯ I prefer not to answer.

What is your five-digit zip code?

Which of the following best describes where you currently live?

(Please select one per statement.)

- ◯ Rural area (Less than 2,500 people)
- ◯ Small town (2,500 - 9,999 people)
- ◯ Small city (10,000 - 49,999 people)
- ◯ Urban area (50,000 or more people)

Appendix Table 1B. All models ran with income included.

Model	Predictor	Coefficient	Standard Error	P-value
Around-the-home viewing extent	Asian only	-1.03	0.12	>.001
	Black only	-0.83	0.06	>.001
	Latino only	-0.63	0.07	>.001
	Latino + White	-0.56	0.09	>.001
	Multiracial	-0.41	0.10	>.001
	Native American	-0.21	0.14	0.14
	Native American + White	0.25	0.12	0.04
	Another race or ethnicity	-0.11	0.13	0.41
	Support	0.08	0.02	>.001
	Identity	0.38	0.02	>.001
	Importance	0.07	0.02	0.001
	Income	0.01	0.01	0.38
Away-from-home viewing extent	Asian only	-0.40	0.12	>.001
	Black only	-0.16	0.06	0.007
	Latino only	-0.20	0.07	0.005
	Latino + White	-0.04	0.09	0.71
	Multiracial	0.12	0.10	0.22
	Native American	0.26	0.14	0.05
	Native American + White	0.30	0.12	0.02
	Another race or ethnicity	0.07	0.13	0.61
	Support	0.38	0.02	>.001
	Identity	0.16	0.02	>.001
	Importance	0.40	0.02	>.001
	Income	0.02	0.01	0.04
Ethnoracial differences in perceived support	Asian only	0.18	0.11	0.07
	Black only	0.36	0.06	>.001
	Latino only	0.55	0.07	>.001
	Latino + White	0.91	0.10	>.001
	Multiracial	0.36	0.09	>.001
	Native American	0.43	0.13	>.001
	Native American + White	0.11	0.11	0.35
	Another race or ethnicity	0.04	0.12	0.16
	Income	0.11	0.01	>.001
Identity by ethnoracial group	Asian only	-0.53	0.11	>.001
	Black only	-0.30	0.06	>.001
	Latino only	-0.27	0.07	>.001
	Latino + White	0.24	0.10	0.01
	Multiracial	-0.13	0.10	0.17
	Native American	-0.07	0.14	0.60
	Native American + White	0.22	0.12	0.08
	Another race or ethnicity	-0.06	0.13	0.61
		0.05	0.01	>.001

	Income			
Ethnoracial differences in wildlife viewing importance	Asian only	0.09	0.11	0.42
	Black only	0.44	0.05	>.001
	Latino only	0.41	0.07	>.001
	Latino + White	0.91	0.12	>.001
	Multiracial	0.16	0.10	0.11
	Native American	0.61	0.13	>.001
	Native American + White	0.28	0.12	0.02
	Another race or ethnicity	0.24	0.12	0.04
	Income	0.06	0.01	>.001

Appendix Table 1C. Ethnoracial percentages of our sample versus the US census.

Race	Sample percentage	Census Percentage
Asian	1.7%	5.9%
Black or African American	7.1%	12.1%
Hispanic, Latino, or Spanish only	4.8%	7.9%
Hispanic, Latino, or Spanish + White	2.3%	3.8%
Multiracial	2.3%	8.4%
Native American	1.2%	.7%
Native American + White	1.4%	1.2%
Another race or ethnicity	1.3%	.7%
White	77.9%	59.3%

Appendix Table 1D. Participation percentages around-the-home by ethnoracial group in days

	Number of days respondents spend wildlife viewing annually								
Ethnoracial Identity	**0**	**1-30**	**31-60**	**61-90**	**91-120**	**121-150**	**151-180**	**181-220**	**221+**
Asian only	13.7%	53.4%	10.8%	6.4%	4.0%	2.0%	3.2%	0.8%	5.6%
Black only	7.4%	52.2%	15.8%	8.8%	5.3%	1.9%	2.3%	1.8%	4.5%
Latino only	6.7%	48.0%	15.4%	10.3%	6.6%	3.1%	2.7%	1.5%	5.7%
Latino + White	7.5%	35.0%	22.1%	11.1%	6.7%	4.0%	2.2%	5.1%	6.2%
Multiracial	7.7%	39.3%	15.8%	8.3%	8.9%	2.9%	2.3%	3.4%	11.5%
Native American	6.5%	40.5%	11.4%	7.0%	4.3%	5.9%	4.9%	4.9%	14.6%
Native American + White	5.7%	28.7%	11.3%	8.7%	6.1%	3.9%	2.6%	4.3%	28.7%
Another race or	5.3%	39.2%	12.4%	6.2%	6.7%	4.3%	4.3%	3.3%	18.2%

ethnicity									
White	5.6%	35.6%	11.8%	8.2%	6.8%	4.5%	4.0%	3.6%	20.0%

Appendix Table 1E. Participation percentages away-from-home by ethnoracial group in days

	Number of days respondents spend wildlife viewing annually								
Ethnoracial identity	**0**	**1-30**	**31-60**	**61-90**	**91-120**	**121-150**	**151-180**	**181-220**	**221+**
Asian only	7.7%	45.5%	24.8%	9.8%	5.3%	3.3%	0.8%	1.6%	1.2%
Black only	7.8%	39.3%	24.7%	12.3%	6.6%	3.2%	3.0%	1.7%	1.4%
Latino only	4.6%	46.3%	20.8%	13.1%	6.5%	3.4%	2.1%	1.3%	1.8%
Latino + White	3.2%	31.8%	29.9%	18.9%	7.8%	2.4%	2.7%	2.2%	1.1%
Multiracial	4.7%	36.7%	28.7%	13.5%	6.2%	4.1%	1.8%	2.1%	2.3%
Native American	3.3%	35.0%	27.2%	10.0%	8.9%	5.0%	1.7%	3.3%	5.6%
Native American + White	4.4%	35.4%	23.9%	13.3%	7.1%	4.0%	4.9%	3.1%	4.0%
Another race or ethnicity	4.8%	44.0%	20.8%	7.7%	7.7%	5.3%	2.4%	1.4%	5.8%
White	7.9%	39.1%	23.6%	11.7%	7.1%	4.0%	2.2%	1.7%	2.8%

Appendix 2A: MN DNR NWP Questionnaire

* **Thank you for your interest in taking this survey! Before we get started, we would like to share some information about this research study with you.**

ABOUT THIS STUDY

Virginia Tech is collaborating with the Minnesota Department of Natural Resources (MNDNR) Nongame Wildlife Program (NWP) to conduct a research study that aims **to learn more about Minnesotans who are interested in nature and conservation** (IRB Protocol #21-850). By sharing your thoughts, you can help us understand how the NWP can better serve all Minnesotans.

This survey should take you about 15-20 minutes to complete. Your participation in this research study is **voluntary and anonymized**. Your individual responses, if shared publicly, will be de-identified with minimal risk of your reidentification. The results of the survey will be published in summary form in reports, a graduate thesis, and journal articles. Your de-identified survey responses may be made available to the MNDNR Nongame Wildlife Program and may be archived online in a publicly accessible format. There are no known risks associated with your participation in this research; there are no right or wrong answers to survey questions; and you can leave the survey at any time, for any reason.

If you have any questions regarding this study or would like more information, please contact Kelsey Jennings at mn.nwp@vt.edu or (681) 539-0388. If you have any questions or concerns about this study's conduct or your rights as a research subject, you may contact the Virginia Tech IRB at 540-231-3732 or at irb@vt.edu.

Do you consent to participate in this research study?

(Please select one.)

- ◯ Yes
- ◯ No

* **Before we continue with the rest of the survey, we have just a few quick questions about you.**

In **what year** were you born?

(Please select your birth year from the drop-down list.)

-- Select --

< Next

* Where do you live for a majority of the year?

(Please select one.)

- ◯ In Minnesota
- ◯ In a state other than Minnesota
- ◯ In a country other than the United States

< Next

* How did you hear about this survey?

- ○ Through the **Minnesota State Parks and Trails Facebook** page
- ○ Through the **Minnesota Scientific and Natural Areas Facebook** page
- ○ Through the **Minnesota Nongame Wildlife Program Facebook** page
- ○ Through an **email** from the **MNDNR Nongame Wildlife Program**
- ○ **None of the above**, I heard about this survey somewhere else.

< Next

First, we are interested in your participation in various forms of outdoor recreation.

In which of the following **outdoor recreation activities**, if any, did you participate in in the last 12 months?

(Please select all that apply.)

- ☐ Botanizing or viewing wildflowers, other plants, or fungi
- ☐ Camping
- ☐ Fishing
- ☐ Foraging
  (for wild foods such as mushrooms or berries)
- ☐ Geocaching
- ☐ Hiking or backpacking
- ☐ Horseback riding
- ☐ Hunting
- ☐ Motorized boating
- ☐ Non-motorized boating
  (such as kayaking or canoeing)
- ☐ Off-roading or use of Off-Highway Vehicles
  (such as ATVs or snowmobiles)
- ☐ Recreational shooting sports or archery
- ☐ Road or mountain biking
- ☐ Rock climbing or bouldering
- ☐ Running, jogging, or walking
- ☐ Swimming
- ☐ Winter sports
  (such as skiing, snowboarding, or snowshoeing)
- ☐ **None of the above**, I do not participate in any of these activities.

In which, if any, of the following forms of **wildlife viewing** do you participate in a typical year?

*Note: For this survey, "**wildlife**" refers to all animals, such as birds, fish, insects, mammals, amphibians, and reptiles, that are living in natural environments, including in urban and semi-urban places. Wildlife does not include animals living in artificial or captive environments, such as aquariums, zoos, or museums, or domestic animals such as farm animals or pets.*

*"**Wildlife viewing**" refers to intentionally observing, photographing, or collecting data on wildlife; improving or maintaining wildlife habitat; or visiting parks and natural areas for the primary purpose of wildlife viewing. Wildlife viewing does not include simply noticing wildlife while doing something else, such as gardening, exercising, hunting, fishing, or intentionally scouting for game.*

(Please select all that apply.)

- ☐ Closely observing wildlife or trying to identify unfamiliar types of wildlife
- ☐ Collecting data on wildlife
- ☐ Photographing or taking pictures of wildlife
- ☐ Feeding wild birds
- ☐ Feeding other wildlife
- ☐ Maintaining plantings or natural areas for the benefit of wildlife
- ☐ Visiting parks and natural areas to observe, photograph, or feed wildlife
- ☐ **None of the above,** I did not participate in any of these forms of wildlife viewing in the past year.
- ☐ I **did not participate** in any of these forms of wildlife viewing in the past year.

To what extent are you interested in observing, photographing, or collecting data on the **following types of wildlife**?

(Please select one response per statement.)

	Not at all	Very little	Somewhat	Quite a bit	A great deal
Insects or spiders *(such as butterflies, dragonflies, beetles, etc.)*	○	○	○	○	○
Amphibians *(such as frogs, salamanders, etc.)*	○	○	○	○	○
Reptiles *(such as turtles, snakes, etc.)*	○	○	○	○	○
Birds *(such as songbirds, waterfowl, birds of prey, etc.)*	○	○	○	○	○
Mammals *(such as deer, bears, moose, etc.)*	○	○	○	○	○
Rare and/or vulnerable species *(such as rusty-patched bumble bees, Blanding's turtles, trumpeter swans, etc.)*	○	○	○	○	○
Freshwater fish *(such as sunfish, darters, trout, etc.)*	○	○	○	○	○

In this section of the survey, we will ask you about where and how often you participate in outdoor recreation.

How many days do you spend participating in any form of outdoor recreation (including wildlife viewing) in each of the following locations in the last 12 months?

(Please select the response that contains your best estimate for the number of days you spend recreating in each location. If you do not typically participate in recreation in these locations, please select 0 days.)

	1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	151-180 days	181-210 days	211 or more days	0 days
Around or within 1 mile of your home	○	○	○	○	○	○	○	○	○
More than 1 mile away from your home, but within Minnesota	○	○	○	○	○	○	○	○	○
Outside of Minnesota or outside of the United States	○	○	○	○	○	○	○	○	○

In the last 12 months, in **which locations** do you participate in outdoor recreation in Minnesota?

(Please select all that apply.)

- [ ] My own home or property
- [ ] Property of friends or family
- [ ] Other privately-owned areas *(such as lands owned by land trusts, non-profit organizations, private companies, or individuals)*
- [ ] Locally-managed areas *(such as town or county parks, trails, or open spaces)*
- [ ] State-managed areas *(such as state parks, forests, water accesses, fishing areas, conservation areas, or Wildlife Management Areas)*
- [ ] Federally-managed areas *(such as National Parks, National Wildlife Refuges, Bureau of Land Management Land, Waterfowl Production Areas, or National Forests)*
- [ ] Tribal lands
- [ ] I am unsure who owns or manages the areas where I participate in outdoor recreation.
- [ ] **None of the above,** I do not participate in outdoor recreation in any of the above locations.

Next, we would like to know more about how you volunteer for the conservation of nature. In this survey, the conservation of nature can be defined as any voluntary action taken to benefit habitats, wildlife, or nature in general. For example, actions taken to conserve biodiversity and/or foster healthy environments.

To begin, we want to know about your general participation in volunteering for the conservation of nature.

In which of the following activities have you participated in the last 12 months?

(Please select all that apply.)

- [ ] **Informing** or **teaching** others about the conservation of nature
- [ ] **Collecting data** on wildlife or habitat through a **website or phone application** *(such as eBird or iNaturalist)*
- [ ] **Collecting data** on wildlife or habitat through an **in-person event** *(such as bird banding or animal counts)*
- [ ] **Cleaning up** trash or litter
- [ ] **None of the above**, I have not participated in these types of volunteering.

Now, we want to know about how you may participate in various forms of civic engagement, or actions that address issues of public concern, related to the conservation of nature.

In which of the following activies related to nature or conservation have you participated in the last 12 months?

(Please select all that apply.)

- [ ] **Voting** for a **candidate** who supports conservation of nature
- [ ] **Volunteering in support** of *(such as made phone calls or talked to others)* a **candidate** who supports conservation of nature
- [ ] **Participating as an active member** in a nature and/or conservation organization *(such as The Nature Conservancy, Izaak Walton League, etc.)*
- [ ] **Contacting** a representative regarding initiatives that support the conservation of nature *(such as city council members, U.S. legislators, etc.)*
- [ ] **Advocating** for policies or actions that support conservation of nature *(such as encouraging support from friends or family)*
- [ ] **Donating money** to representatives that support the conservation of nature
- [ ] **Donating money** to support the conservation of nature
- [ ] **Purchasing products** that benefit wildlife or whose proceeds support the conservation of nature
- [ ] **None of the above**, I have participated in another form of civic engagement
- [ ] **None of the above**, I have not participated in any form of civic engagement related to the conservation of nature.

We are also interested in the ways you might care for natural spaces belonging to you or others, sometimes called **land stewardship**.

Think about the ways you may contribute to the restoration of environments. In the last 12 months, I have restored lands or yards...

(Please select all that apply.)

- ☐ ... belonging to **me** or **my family** *(such as removing invasive species)*
- ☐ ... belonging to **someone else** *(such as restoring lands in regional or state parks)*
- ☐ **None of the above**, I have not participated in land stewardship.

For what purpose have you restored lands or yards belonging to you or others?

(Please select all that apply.)

- ☐ To make them more beneficial for **native wildlife** *(such as planting a garden for birds, pollinators, etc.)*
- ☐ To make them more beneficial for **native plant species** *(such as removing invasive species)*
- ☐ To make them more beneficial for **rare and vulnerable species** *(such as not raking leaves)*
- ☐ **None of the above**, I restored lands for another purpose.

Next, we would like to know more about what might encourage you to volunteer more for the conservation of nature than you currently do.

(Please select one response per statement.)

I would be more likely to volunteer with programs that...

	Not at all	Slightly	Moderately	Very	Extremely
... provide an opportunity to **have fun** in the outdoors	○	○	○	○	○
... provide an opportunity to interact with **like-minded people**	○	○	○	○	○
... provide **access to professionals** who could answer questions I have *(such as those about land management, species, etc.)*	○	○	○	○	○
... **teach me** more about nature *(such as specific skills or information about rare species)*	○	○	○	○	○
... allow me to experience **interesting places** in nature *(such as unique or protected lands)*	○	○	○	○	○

(Please select one response per statement.)

I would be more likely to volunteer with programs that...

	Not at all	Slightly	Moderately	Very	Extremely
... take place in a natural setting I am **interested in visiting**	○	○	○	○	○
... take place on lands where I participate in **outdoor recreation** *(such as state or regional parks)*	○	○	○	○	○
... take place on lands that are **important to me or my family**	○	○	○	○	○
... **conserve or restore environments** that have been damaged	○	○	○	○	○
... **preserve the environment** for future generations	○	○	○	○	○

To what extent do people in each of the following groups encourage your volunteering for the conservation of nature?

(Please select one response per statement.)

	Not at all	Very little	Somewhat	Quite a bit	A great deal
Family member(s)	○	○	○	○	○
Friend(s)	○	○	○	○	○
Mentor(s)	○	○	○	○	○

To what extent do each of the following limit the extent of your volunteering for the conservation of nature in a typical year?

(Please select one response per statement.)

	Not at all	Very Little	Somewhat	Quite a bit	A great deal
Lack of **free time** to volunteer	○	○	○	○	○
Not knowing about volunteering opportunities	○	○	○	○	○
Few **people to participate** in volunteering **with**	○	○	○	○	○
Lack of **specialized skills** to participate in current volunteer opportunities	○	○	○	○	○
Lack of volunteer opportunities **that are relevant to me**	○	○	○	○	○
Not feeling welcome at volunteering opportunities	○	○	○	○	○

In this section of the survey, we would like to know more about your experiences with and thoughts about the Nongame Wildlife Program, the division within the Minnesota Department of Natural Resources (MNDNR) responsible for conserving nongame fish and wildlife and their habitats. Nongame fish and wildlife are those that are not ordinarily taken for sport, fur, or food and often include rare and threatened wildlife species.

How familiar are you with the MNDNR Nongame Wildlife Program?

(Please select one.)

- ○ Not at all familiar
- ○ Slightly familiar
- ○ Moderately familiar
- ○ Very familiar
- ○ Extremely familiar

Now, we would like to know more about your **familiarity** with different aspects of the MNDNR Nongame Wildlife Program. How familiar are you with each of the following aspects of the MNDNR Nongame Wildlife Program?

(Please select one response per statement.)

	Not at all familiar	Slightly familiar	Moderately familiar	Very familiar	Extremely familiar
MNDNR Nongame Wildlife Program **staff**	○	○	○	○	○
MNDNR Nongame Wildlife Program **activities**	○	○	○	○	○
MNDNR Nongame Wildlife Program **mission**	○	○	○	○	○

Have you seen this icon on your state tax forms?

(Please select one.)

- ◯ **Yes**, I have seen this icon before and I can recall what it is for
- ◯ **Yes**, I have seen the icon on tax documents but do not recall what it was for
- ◯ **No**, I have not seen this icon before

We would also like to know more about your interest in supporting the MNDNR Nongame Wildlife Program by participating in wildlife or habitat conservation activities in the future.

How likely would you be to participate in each of the following **opportunities *with or in support of the MNDNR Nongame Wildlife Program*** in the next 5 years, if you had the opportunity to do so?

(Please select one response per conservation activity.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Informing or **teaching** others about the conservation of nature	◯	◯	◯	◯	◯
Collecting data on wildlife or habitat through a **website or phone application** *(such as eBird or iNaturalist)*	◯	◯	◯	◯	◯
Collecting data on wildlife or habitat through an **in-person event** *(such as bird banding or animal counts)*	◯	◯	◯	◯	◯
Restoring lands belonging to **me** or **my family** *(such as removing invasive species)*	◯	◯	◯	◯	◯
Restoring lands belonging to **someone else** *(such as restoring lands in regional or state parks)*	◯	◯	◯	◯	◯

How likely would you be to participate in each of the following **opportunities *with or in support of the MNDNR Nongame Wildlife Program*** in the next 5 years, if you had the opportunity to do so?

(Please select one response per conservation activity.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Participating as an active member in a nature and/or conservation organization *(such as The Nature Conservancy, Izaak Walton League, etc.)*	◯	◯	◯	◯	◯
Advocating for policies or actions that conserve nature	◯	◯	◯	◯	◯
Donating money to support the conservation of nature	◯	◯	◯	◯	◯
Purchasing products that benefit wildlife or whose proceeds support conservation	◯	◯	◯	◯	◯
Cleaning up trash or litter	◯	◯	◯	◯	◯

We are also interested in any experiences you may have with the programs and services offered by the MNDNR Nongame Wildlife Program.

The MNDNR Nongame Wildlife Program offers services that connect people with wildlife and support wildlife conservation. Which of the following services, if any, have you participated in or used in the past 5 years?

(Please select all that apply.)

- ☐ **Volunteer research** or wildlife **data collection** opportunities *(such as the Minnesota Loon Monitoring Program and/or the Minnesota Frog & Toad Calling Survey)*
- ☐ **Technical assistance** or **information** about **improving wildlife habitat**
- ☐ **Information about wildlife** in the state on their website or social media pages
- ☐ **Live stream wildlife cameras** *(such as the DNR EagleCam and/or FalconCam)*
- ☐ **None of the above**, I have participated in or used another service from the MNDNR Nongame Wildlife Program.
- ☐ **None of the above**, I have not participated in or used any programs or services in the last 5 years.

To what extent were you **satisfied with** the services that you participated in or used?

(Please select one response per statement.)

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Extremely satisfied
Volunteer research or wildlife **data collection** opportunities *(such as the Minnesota Loon Monitoring Program and/or the Minnesota Frog & Toad Calling Survey)*	○	○	○	○	○
Technical assistance or **information** about **improving wildlife habitat**	○	○	○	○	○
Information about wildlife in the state	○	○	○	○	○
Live stream wildlife cameras *(such as the DNR EagleCam and/or FalconCam)*	○	○	○	○	○

Now, we would like to know about your past financial support of the MNDNR Nongame Wildlife Program.

Below are a variety of ways that conservation provided by the MNDNR Nongame Wildlife Program is *financially* supported by the public in Minnesota. Which of the following **purchases or contributions**, if any, have you made in the past 5 years?

(Please select all that apply.)

- ☐ **Minnesota Critical Habitat license plates**, sometimes called **wildlife license plates** *(loon, ladyslipper, deer, chickadee, etc.)*
- ☐ **Voluntary donation** of a portion of **state income or property tax return** to the MNDNR Nongame Wildlife Program *(indicated with a loon logo on Minnesota state tax forms)*
- ☐ **Direct donation** to the MNDNR Nongame Wildlife Program *(including donations to the MN DNR EagleCam)*
- ☐ **None of the above**, I have not made any of these purchases or contributions.

Have you purchased any of the following Minnesota Critical Habitat license plates, sometimes called wildlife license plates, in the past 5 years?

(Please select all that apply.)

Critical Habitat license plate

State Parks and Trails

- [ ] **None of the above,** I have not purchased any of the above license plates in the last five years.
- [ ] **None** - I have not purchased any of the above license plates in the last five years.

In the past five years, have you purchased any of the following in the state of Minnesota?

(Please select all that apply.)

- ☐ Hunting and/or trapping license
- ☐ Fishing license
- ☐ State Parks and Trails pass and/or license plate
- ☐ Fish and Wildlife Habitat Stamps *(including the Federal Duck Stamp)*
- ☐ County or regional park and/or natural area pass
- ☐ The Great Minnesota Ski Pass
- ☐ **None of the above**, I have not purchased any of these.

Now, we would like to know about future purchases or contributions you may make to benefit the MNDNR Nongame Wildlife Program.

How likely are you to make the following **purchases or contributions** in the next 5 years, assuming they are available?

(Please select one response for each type of contribution, regardless of whether or not the option is currently available in Minnesota.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
Minnesota Critical Habitat license plates, sometimes called **wildlife license plates***(loon, ladyslipper, deer, chickadee, etc.)*	○	○	○	○	○
Voluntary donation of a portion of **state income or property tax return** to the MNDNR Nongame Wildlife Program *(indicated with a loon logo on Minnesota state tax forms)*	○	○	○	○	○
Direct donation to the MNDNR Nongame Wildlife Program *(including donations to the MNDNR EagleCam)*	○	○	○	○	○
Fees for an event hosted by the MNDNR Nongame Wildlife Program	○	○	○	○	○
Virtual products from the MNDNR Nongame Wildlife Program *(such as podcasts, e-books, and other online materials)*	○	○	○	○	○
Physical products from the MNDNR Nongame Wildlife Program *(such as books, maps, and other merchandise)*	○	○	○	○	○

We would like to understand what might encourage you to provide financial support to wildlife conservation through the MNDNR Nongame Wildlife Program.

If all of the following options were available, in which ways would you most prefer to give?

(Please rank from most preferred to least preferred.)

Drag your choices here to rank them

- Through the mail
- Online through the MNDNR website
- On state income tax
- Through a mobile interface *(such as a QR code during an event)*
- Through an automatic recurring payment

Most Preferred ↑

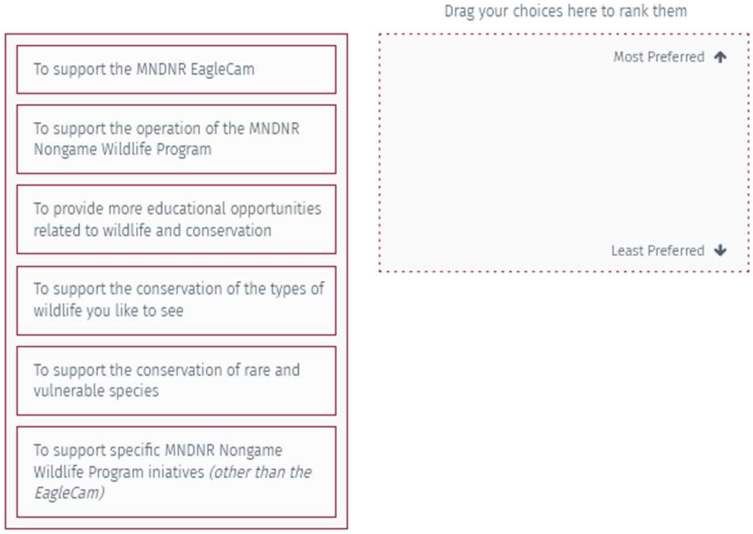
Least Preferred ↓

If all of the following options were available, how frequently would you most prefer to give?

(Please rank from most preferred to least preferred.)

In which of the following ways would you prefer your donations be used?

(Please rank from most preferred to least preferred.)



Next, we would like to know more about what might encourage you to provide more financial support than you currently do to the MNDNR Nongame Wildlife Program.

Think about how likely you would be to provide more financial support than you currently do if each of the following statements were true.

I would consider giving more if...

(Please select one response per statement.)

	Not at all likely	Slightly likely	Moderately likely	Very likely	Extremely likely
... **my name appeared** in a **physical or online directory** with other people who have made financial contributions	○	○	○	○	○
... **my name appeared** on **a physical item** *(such as a brick or bench)*	○	○	○	○	○
... my contribution positively impacted **my neighborhood and/or community** *(such as supporting a species that is found in our area)*	○	○	○	○	○
... my contribution assisted in efforts to **support biodiversity**	○	○	○	○	○
... I **received information** on how **my donations are used**	○	○	○	○	○

Next, we would like to know more about your thoughts on the MNDNR Nongame Wildlife Program.

To what extent do you agree or disagree with the following statements?

(Please select one response per statement.)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I **share personal values** with the MNDNR Nongame Wildlife Program	○	○	○	○	○
I have **strong personal ties** to the MNDNR Nongame Wildlife Program	○	○	○	○	○
I **trust** the MNDNR Nongame Wildlife Program to achieve their mission	○	○	○	○	○
The MNDNR Nongame Wildlife Program has **a need for donations**	○	○	○	○	○
The MNDNR Nongame Wildlife Program **appropriately uses donations**	○	○	○	○	○
I am **skeptical** that the MNDNR Nongame Wildlife Program will achieve their mission	○	○	○	○	○

To what extent do you feel the following statements are true?

(Please select one response per statement.)

	Not at all true	Slightly true	Moderately true	Very true	Extremely true
The MNDNR Nongame Wildlife Program **provides a high quality of service**	○	○	○	○	○
Donating to the MNDNR Nongame Wildlife Program **makes me feel generous**	○	○	○	○	○
I worry about **potential negative effects** on the MNDNR Nongame Wildlife Program **if I stop donating**	○	○	○	○	○
I donate to the MNDNR Nongame Wildlife Program because I feel a **personal responsibility** to care for wildlife and habitat	○	○	○	○	○
The **quality of service** the MNDNR Nongame Wildlife Program provides **is low**	○	○	○	○	○

We would like to learn how the MNDNR Nongame Wildlife Program can best communicate with Minnesotans about conservation issues.

Which, if any, of the following ways are you interested in **receiving information** from the MNDNR Nongame Wildlife Program?

Note: *Your responses are for data collection only. The MNDNR Nongame Wildlife Program* ***will not*** *receive your specific response nor contact you as a result of this survey.*

(Please select all that apply.)

- ☐ Printed materials *(such as brochures and maps)*
- ☐ Mailed newsletter or other subscription
- ☐ Email update or e-newsletter
- ☐ Online magazine
- ☐ MNDNR Nongame Wildlife Program website
- ☐ Local news *(such as television or online or print newspapers)*
- ☐ Blogs
- ☐ Facebook
- ☐ Twitter
- ☐ Tik-Tok
- ☐ Instagram
- ☐ YouTube
- ☐ Podcast
- ☐ Text alert
- ☐ One-on-one interaction with agency staff
- ☐ **None of the above,** I would prefer not to receive information from the MNDNR Nongame Wildlife Program.

Knowing what you know about the MNDNR Nongame Wildlife Program, do you feel that the name "Nongame Wildlife Program" appropriately describes the work that they do?

(Please select one.)

- ○ **Yes**, "Nongame Wildlife Program" appropriately describes their work.
- ○ **No**, "Nongame Wildlife Program" does not appropriately describe their work.

This is the final section of the survey. We have just a few more quick questions about you.

Next Question

What is your **gender**?

(Please select one.)

- ○ Man
- ○ Woman
- ○ Non-binary
- ○ Prefer to not disclose
- ○ Prefer to self-describe

What is your race and/or ethnicity?

(Please select all that apply.)

- [ ] American Indian or Alaska Native
- [ ] Asian
- [ ] Black or African American
- [ ] Hispanic, Latino, or Spanish
- [ ] Middle Eastern or North African
- [ ] Native Hawaiian or other Pacific Islander
- [ ] Some other race or ethnicity
- [ ] White

What is your five-digit zip code?

Which of the following best describes where you currently live?

(Please select one per statement.)

- ◯ Rural area (Less than 2,500 people)
- ◯ Small town (2,500 - 9,999 people)
- ◯ Small city (10,000 - 49,999 people)
- ◯ Urban area (50,000 or more people)

What was your total household income during the past 12 months?

(Please select one.)

- ◯ Less than $24,999
- ◯ $25,000 - $49,999
- ◯ $50,000 – $74,999
- ◯ $75,000 – $99,999
- ◯ $100,000 – $124,999
- ◯ $125,000 or more
- ◯ I prefer not to answer.

What is the **highest degree or level of school** you have completed?

(Please select one.)

- ◯ High school diploma, equivalent, or less
- ◯ Some college
- ◯ Associate's or technical degree
- ◯ Bachelor's degree
- ◯ Professional, master's or doctoral degree

Are you interested in being entered to receive one of 15 annual Minnesota State Park passes?

Note: *You will not be contacted by researchers other than to alert those selected for a Park pass.*

(Please select one.)

- ◯ Yes
- ◯ No

Would you like to receive a copy of the final results of this study?

Note: *You will not be contacted by researchers other than to distribute the final results.*

(Please select one.)

- ◯ Yes
- ◯ No

Appendix 3A: Codebook for Program Practitioners

Parent Code	Child codes
Type of organization	• Established non-profit • Grassroots organization • Government • Youth vs all ages
Practitioner program features	• Mission • Effective programs • Ineffective programs • Effective community science

	• Outreach
Recommendations for the MNDNR NWP to build community science programs	• Relationship-building • Intentionality • Relevancy • Trust • Gear
Yosso Framework Capitals	• Navigational • Resistant • Social • Familial
How the MNDNR NWP can support organizations	• Funding • Subject matter expertise • Structural change
Community Science Program Feedback	• Positives • What needs improving
Emergent Codes	• Recommendations for NWP • Misunderstandings of DNR/mission • Barriers

Appendix 3B: Codebook for Program Participants

Parent Code	Child codes
Recreation Participation	• Hiking, walking, running • Water sports • Hunting/fishing
Recommendations for the MNDNR NWP to build community science programs	• Relationship-building • Intentionality • Relevancy • Trust • Gear
Yosso Framework Capitals	• Navigational • Resistant • Social • Familial
Community Science	• Previous participation • Facilitators • Constraints
Community Science Program Feedback	• Positives • What needs improving
Emergent Codes	• Recommendations for NWP • Misunderstandings of DNR/mission